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亚洲大陆的瘤足蕨屬 (Plagiogyria) 的研究

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一、历史的簡述

1849年 Kunze 氏首先提出了 *Plagiogyria* 这个名詞，作为那个含义極为广泛而古老的罗曼蕨屬 (*Lomaria*) 的一个組。这个組名的模式种是日本的 *Lomaria euphlebia* Kunze 和爪哇的 *Lomaria pycnophylla* Kunze。Kunze 氏的分类法以后为英国 J. D. Hooker 和 J. Baker 等人所采用。一直到了1858年，Mettenius 氏根据孢子囊有完整而斜生的环带，無盖的子囊群生于加厚的长托上，和膨大三角形的叶柄基部两外側面各具有几个突出的排成縱列的气囊体等特点，首先把这个組名从罗曼蕨屬分立为一个独立的屬，即我們今日叫做瘤足蕨屬，包括5个种，并把它列入桫欏蕨科 (*Cyatheaceae*)。自此以后，这个屬就被植物学家作为一个自然的蕨屬接受了，但是它在系統分类系統上的位置則因人而异，迄無定論，例如瑞士 Christ 氏把它放在所謂“水龙骨科”的鳳尾蕨屬 (*Pteris*) 与烏毛蕨屬 (*Blechnum*) 之間，德国 Diels 氏則把它放在同一科的而極不調和的碎米蕨族。丹麦 Christensen 氏沿袭 Diels 氏的分类法，未加以任何变革，一直到了1936年在他的蕨类植物名詞索引补遺第三册內，始把这个屬列为所謂“水龙骨科”的第一个屬。1926年英国蕨类植物形态学家 Bower 氏根据形态解剖的特点，把这个屬第一次上升为一个独立的单屬的科，即瘤足蕨科 (*Plagiogyriaceae*)。从此几乎为所有进步的植物学家当作一个自然的蕨科看待，这是有充分理由的。

1929年美国 Copeland 氏对瘤足蕨屬仍然作为“水龙骨科”的一个屬进行了一个全面的但并不够深入的研究。在他的专著里他列举了世界33个种，其中10种产于热带中部美洲，其余23种产于亚洲东南部，有一种南达澳洲东北部，但他所承認的許多种現已夷为其他一些种的同义詞了。我近来研究了本屬的亚洲的标本材料，發現仅亚洲大陆包括海南、台灣、日本和朝鮮有33种，因此本屬已知的种类現已增至約50种，其中約有42种产于亚洲。換句話說，本屬今日已知之种比一百年前 Mettenius 氏創立本屬时增加了10倍，这就使瘤足蕨屬成为蕨类植物界的一个相当大的屬。可以預言，将来發現更多新种的可能性——尤其在中国西南部的山区，仍然是很大的。

二、瘤足蕨屬在系統分类系統上的位置

首先，应該指出，瘤足蕨屬是个非常自然的蕨屬，并且它本身組成了一个单屬性的自

然科，瘤足蕨科。它区别于水龙骨科和其他薄囊蕨科之点在于它的孢子囊有一个完整而斜生的环带和由 5—6 排的細胞組成的長柄，孢子为四面形，它的粗大而直立的根状茎有接近于管状型的中柱体，叶柄基部有一条V字形的或者分裂为三条維管束，植株通体不具眞正的鱗片和毛，幼叶开放时遍体被粘質的并且不久就脱落的駝毛型的毛茸，叶柄基部膨大成三角形，在两外側面各具有 1—2 个或更多而成縱列的疣状突起，叫做气囊体。这种气体在許多种类往往还从基部沿着叶柄两側分布或者更向上沿叶軸分布，生于側生羽片基部下方。这些都被認为是本屬的特出的原始类型的特征，但与此同时，本屬也具有一个进步的征象，即它的孢子叶上的生于加厚分叉叶脉頂部的长形孢子囊群在發生起源上是屬于“混生型”的。

在外部形态方面，本屬表現着一种奇特的綜合型和比較原始型的性状，使本屬的形体近似于罗曼蕨屬，并且还显示着本屬在分类系統的位置上好像代表一个綜合性的类型，例如在它粗大直立的根状茎內的中柱体和叶迹的构造以及叶柄基部膨大的情况，幼叶通体被粘質的駝毛状的絨毛，而不具眞正的鱗片和毛。这些特征方面，本屬与紫萁蕨屬(*Osmunda*) 相同，特別关于生在叶脉分叉的肥大頂部的表面生的长形孢子囊群的特点上，本屬也同于紫萁蕨科 (Osmundaceae) 的主产于南美洲的 *Todea* 屬，所不同者为本屬的孢子囊群，幼时被特化为干膜質而有嚙蝕状的、强度反卷的孢子叶的边緣所复盖，孢子囊有斜生的完整环带，孢子囊群在發生起源上为“混生型”，每个孢子囊的孢子产量远較低 (48 个) 和叶柄基部的两外側面具有作为气体交換用的气囊体。

另一方面，根据 Bower 氏的意見，瘤足蕨和海金沙屬也有关系，例如在海金沙科 (Schizaeaceae) 的根状茎的解剖构造上，同时并存着原始中柱、管状中柱及分体中柱三种类型，而在瘤足蕨屬 (如 *P. pycnophylla*) 的匍匐茎中也有同样的情况。更有进者，瘤足蕨屬和海金沙科的 *Aneimia* 屬的关系也表現在二者的分生中柱的根状茎有軸部內卷 (axillary involution) 現象和孢子囊的結构在一定程度上的相似，但本屬有表面生的和在發生起源上为“混生型”的孢子囊群，故与海金沙科又有着根本上的区别了。

作为一个进化上的特征，分离叶脉是原始类型的蕨类的一般性状的表現，为本屬与紫萁蕨科和大多数的海金沙科以及蚌壳蕨科 (Dicksoniaceae) 所共有的通性，而在表面生的和不具眞正囊群盖的这两个特征上，则瘤足蕨屬又無疑地与 *Todea* (紫萁蕨科) 的关系比之海金沙科或蚌壳蕨科更为密切了，因为在后一科的孢子囊群在發生起源上是叶边生而不是叶表面生的，而且正如上面已經指出，“混生型”的孢子囊群是演化上的进步的特征。这个特征在“单純型”孢子囊群不經过“漸进型”孢子囊群的过程是不会出現的，例如在双扇蕨屬 (*Dipteris*) 所指出的那样。再如在孢子囊的結构上瘤足蕨又極似蚌壳蕨科的狄克松屬(*Dicksonia*)。这两个形态特征在基本上可以追溯到更古老的海金沙类型的起源，特别是 *Aneimia* 屬。孢子囊內所生产的孢子的数目少，这一事实是被認为进化上的一个指标。在这一点瘤足蕨屬和紫萁蕨科以及海金沙科的关系又是疏远的了，但比之蚌壳蕨科的有 64 个孢子的狄克松屬则两者在孢子数目上的差异并不算很大。

从上面討論指出的所有形态上总的异同之点来看，我們可以得出这样的一个結論，那就是瘤足蕨屬 (科) 是个比較原始类型的蕨群，它在近代薄囊蕨綱的分类系統的位置上是孤立着的，因为在整个进化阶梯上，同它下面的具有“单純型”孢子囊群的一些科 (如紫萁

蕨科和海金沙科）相比在亲緣关系上是疏远的，同它上面的一些具有表面生的"混生型"孢子囊群的蕨群（如裸子蕨科的鳳丫蕨屬和中国蕨科的珠蕨屬）的关系也只是表面的現象，虽然 Bower 氏認为这种关系是存在的。至于講到同蕨科和烏毛蕨科的关系，如 J. D. Hooker、Christ 和 Diels 等氏曾經想像的那样，可說是完全沒有根据的，因为瘤足蕨屬（科）同这些科之間在形态构造上找不到什么重要共同之点的存在。

三、瘤足蕨的地理起源和分布

从形态結构的特征方面看，瘤足蕨屬显示着它是經历了相当古老的地質年代的一群蕨类。而从本研究所揭露的它的十分丰富的地区性的种类以及这些种类的集中在中国境內——特别是它的西南山区这一事实来判断，人們有理由認为本屬植物可能起源于中国的一个有力指証。这个論点早在 1902 年已第一次被 Christ 氏指出了 (Christ 在 Bull. Acad. Géogr. Bot. Mans. 第 11 卷 232 頁)。1929 年 Copeland 氏(Copeland 在 Phil. Journ. Sci. 第 38 卷 383 頁) 在他的研究中也做出了同样的結論，虽然他幷沒有提到 Christ 氏的著作。中国西南部是瘤足蕨屬（科）的可能的地理起源的說法，現在不但被在中国存在着本屬大多数的种类这一事实所支持，而且也被在中国还存在着本屬在分类系統上的所有不同种系群所証实。可以这样的假設，就是本屬从远古以来在中国西南山地好像形成了一种雄厚的扩散压力，使本屬的成員能够由此向不同的方向作波浪式的迁移，向西到达喜馬拉雅东部，但幷沒有一种向南到达印度南部半島地区；向南經过印度支那到达馬来亚群島及印度尼西亚；向东南方經菲律宾、西里伯 (Celebes) 到伊利安，更南到澳洲东北部的昆斯兰 (Queensland)，这里到現在为止，只發現一种，即 *Plagiogyria articulata* (Müller) Ching，幷且这个种在形体上很近于日本和中国东南部的华中瘤足蕨 (*P. euphlebia* Mett.)；向东北方，有产于华中和华东的两种，分布到日本及朝鮮南部。这里要特别指出的是，产于日本中部及北部的日本瘤足蕨(*P. Matsumuraeana* Makino)，它一方面与中国貴州的特有种——貴州瘤足蕨(*P. argutissima* Christ) 非常相近，在另一方又与热带中部美洲所产的大約有 9 种以 *P. semicordata* (Presl) Christ 为代表的在形体上非常相似。本屬在亚洲（包括海南，台灣，日本，朝鮮）的已知的 33 种中，有 32 种分布在中国（主要在长江以南），其中有 4 种达于喜馬拉雅山区，5 种达于印度支那，2 种达于日本，至于現在菲律宾，印度尼西亚，馬来亚等地的已知的 10 种也只不过是由中国的四个种系群中所演化出来的姊妹种或者有少数的种还是直接由中国大陆迁移过去的，其中有一个以 *P. pycnophylla* 为代表的种系群，虽然在南洋群島也較为發达，但它的地理分布中心仍然在我国云南西部及附近山区，在这里这个种系群現在共有 12 个种之多，組成了本屬最大的同时也是現存最古老的一个群。

瘤足蕨屬究竟有那 4 个組成的种系群呢？本研究的結果指出，根据形态特征有如下 4 个群和它們相应的产于亚洲大陆上的組成的种：

I. 灰背瘤足蕨 (*Plagiogyria pycnophylla*) 群，有以下的組成种：

P. communis, 滇西瘤足蕨	*P. virescens*, 怒江瘤足蕨
P. decrescens, 短柄瘤足蕨	*P. gigantea*, 大叶瘤足蕨
P. taliensis, 大理瘤足蕨	*P. coerulescens*, 景东瘤足蕨

P. simulans, 尖齿瘤足蕨 | *P. lineata*, 披針瘤足蕨
P. lanuginosa, 絨毛瘤足蕨 | *P. glaucescens*, 灰背瘤足蕨
P. media, 粉背瘤足蕨 | *P. formosana*, 台灣瘤足蕨

II. 奇数瘤足蕨 (*Plagiogyria euphlebia*) 群,有以下的組成种:

P. attenuata, 桃叶瘤足蕨 | *P. grandis*, 尾叶瘤足蕨
P. chinensis, 武夷瘤足蕨 | *P. maxima*, 大瘤足蕨
P. euphlebia, 华中瘤足蕨 | *P. integripinna*, 全叶瘤足蕨

III. 合生瘤足蕨 (*Plagiogyria adnata*) 群,有以下的組成种:

P. japonica, 华东瘤足蕨 | *P. hainanensis*, 海南瘤足蕨
P. caudifolia, 縉云瘤足蕨 | *P. yunnanensis*, 小瘤足蕨
P. subadnata, 岭南瘤足蕨 | *P. assurgens*, 峨嵋瘤足蕨
P. liankwangensis, 两广瘤足蕨 | *P. distinctissima*, 镰叶瘤足蕨
P. adnata, 瘤足蕨

VI. 龙骨軸瘤足蕨 (*Plagiogyria argutissima*) 群,有以下的組成种:

P. tenuifolia, 华南瘤足蕨 | *P. angustipinna*, 狭叶瘤足蕨
P. Dunnii, 倒叶瘤足蕨 | *P. argutissima*, 貴州瘤足蕨
P. stenoptera, 耳形瘤足蕨 | *P. Matsumuraeana*, 日本瘤足蕨

关于上面4个种系群的原始性問題，过去学者們的意見是分歧的。Bower 氏曾一度認为美洲中部热带的屬于第四群的 *P. semicordata* (Presl) Christ 是本屬的原始型的代表,但根据我們今日的了解,屬于这一类型的种在形态解剖方面提供的証据并不支持这种設想。这个种系群的特点是:有薄草質的叶体，相当柔軟和下面呈龙骨形的叶軸，叶柄基部不为显著的膨大，其两侧面仅具有少数不發达的或者甚至退化为不易見的气囊体以及叶柄基部横切面显露三个維管束——所有这些特点都足以指明第四群(龙骨軸瘤足蕨群)包括热带中部美洲所有的种在內,是本屬在长期进化过程中的后来的产物,虽然它今日的分布区比其他三个群更为广泛。在另一方面，Copeland 氏提出了相反的看法，他認为分别代表第一和第三种系群的 *P. pycnophylla* 和 *P. adnata* 这两个种是代表着更为原始类型的。他的理由是:在旧大陆上,本屬在种的数目和分化的多样性,这些事实足以指明在这里瘤足蕨屬有了較长的历史發展时期，而且这两种蕨类在旧大陆上有着最广泛的地理分布。

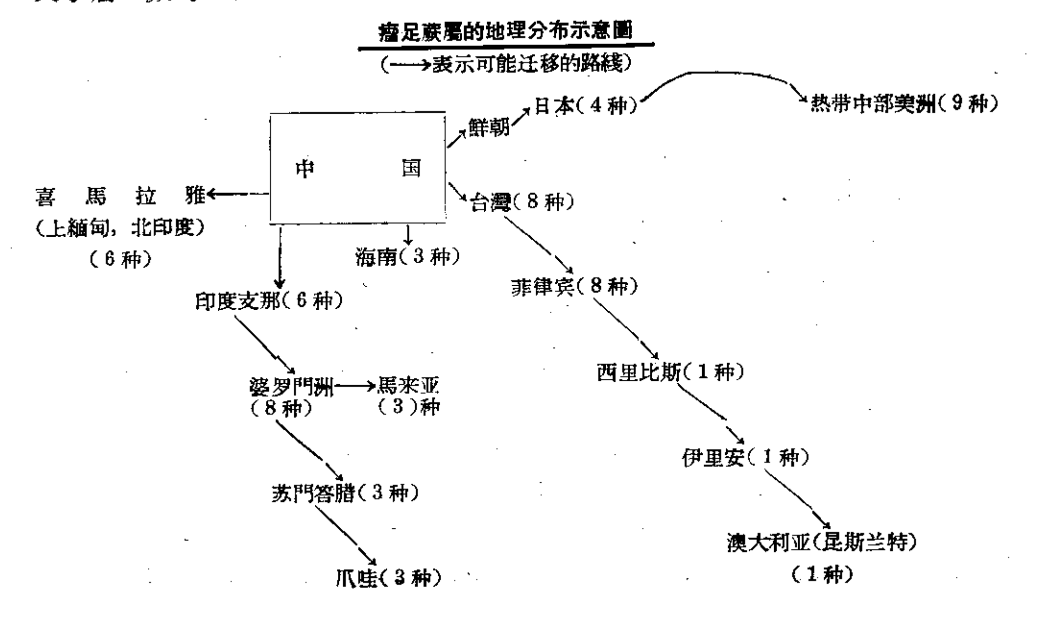
我認为 Copeland 氏关于 *P. pycnophylla* 作为代表着本屬的原始类型的說法是正确的,虽他所理解的这个种实际上是个复合种,由广泛分布在亚洲不同地区的好几个相近的种类組成的，这是分类学上的問題，将在下面加以討論。至于他也把瘤足蕨 (*P. adnata* Bedd.) 同 *P. pycnophylla* 在进化年代的阶梯上等量齐观的看法是錯誤的，虽然前者在地理分布上和后者有着同样的广泛性。实际上,瘤足蕨比之华中瘤足蕨 (*P. euphlebia* Mett.) 还要年輕得多,因为奇数瘤足蕨群 (包括华中瘤足蕨) 的一个成員,大瘤足蕨 (*P. maxima* C. Chr.) 在形态特点上可能是由更古老的灰背瘤足蕨群 (包括 *P. pycnophylla*) 演变出来的本群的祖先类型，并且从这个群可能通过华东瘤足蕨 (*P. japonica* Nakai) 演化为合生瘤足蕨。因为华东瘤足蕨这个类型，現在包括两广瘤足蕨 (*P. liankwangensis* Ching) 和縉云瘤足蕨 (*P. caudifolia* Ching) 在体形上，它恰恰代表着奇数瘤足蕨群和合生瘤足蕨

群的瘤足蕨之間的中間型式，是非常明显的轉化过程。上面已經說过，第四群（龙骨軸瘤足蕨群）包括日本瘤足蕨（*P. Matsumuraeana* Makino）和美洲中部热带的 *P. semicordata* Christ 以及它的相近的种是代表着本属在进化过程中的最后的一群，并且有許多迹象指明，它是从合生瘤足蕨群的一些种，如瘤足蕨和鐮叶瘤足蕨，演化而来的。

我們还可以指出 *P. pycnophylla* Mett. 是代表本屬較为原始类型的論点的另一証据，即这个种以及組成灰背瘤足蕨群的所有其他的种，都有許多形态上的共同特征，其中較为特出的是：他們有較厚的叶質，坚硬木質的下面为圆形的叶柄和叶軸，叶柄基部特别膨大，横切面有一个 V 字形的維管束，其明显而發达的气囊体不仅生于叶柄基部，而且还經常沿叶柄两側向上分布到达叶軸，生于羽片基部下方——所有这些可以看作本屬的一些原始特征。

在地理分布上，本屬的各群的代表种显然成为它的許多衍生种在进化上的分野点。在本屬的分布区內，灰背瘤足蕨群——本屬最發达的一个群，其所有組成的种类分布在南部和西南部，而奇数瘤足蕨群的組成种类則主要分布在东部和东南，并且向东南方一直伸展到澳洲东北部的昆斯兰，在这里本群的代表以 *P. articulata* 的形式出現，它在形体上是同华中瘤足蕨如此相似，以致曾被 J. D. Hooker 和 J. Baker 两氏錯誤地作为华中瘤足蕨看待。通过华东瘤足蕨（*P. japonica* Nakai）而与奇数瘤足蕨群密切联系着的瘤足蕨則分布于中部，西部和西南部，向南直达南洋群島和菲律宾，向东北到日本和朝鮮南部。本屬的第四群，龙骨軸瘤足蕨群，分布最广，在东方有六种，其中有两种十分相近，即貴州瘤足蕨和日本瘤足蕨，后一种从亚洲东北部向东迁移，大致經过北美洲的南端到达热带中部美洲，以 *P. semicordata* Christ 的形式出現，但在形态結构上几乎同日本瘤足蕨沒有重大的不同，在新大陆上它繁衍为大約十个相近的种，但并沒有分化为不同的群，如同在旧大陆上那样，这也可以証明美洲中部热带的瘤足蕨在地理起源上是来自东方的，在进化程序上也是后来的。

关于瘤足蕨屬向各方迁移的可能路綫，可从下面所附的示意圖窺知其梗概。



从作为瘤足蕨的地理起源中心的中国西南部，开始向各方分布的过程中，我們不难看到“种”的数目逐漸减少的情况，并且本屬的代表种就很快的消失，尤其向北方消失最快，这是因为严峻的气候条件的緣故，但在分布区內，随着从地理起源中心的距离的增加，这种分布的規律性受到大地形变化的影响而遭到破坏，例如地势太低、夏季气候太热的平原就不見瘤足蕨的分布，因为瘤足蕨屬作为一个比較古老的蕨群在生态特性上是个严格的热带和亚热带地区高山森林环境条件的蕨屬。为此緣故，它在亚洲大陆向北分布限界为北緯30°上下，虽然在海洋暖流的影响下，个别种类在日本及朝鮮可以向北到达北緯36°—42°之間的地区。在南方，由于馬来亚半島地势平坦，沒有像在菲律宾、婆罗洲和苏門答腊那样的高山森林环境，所以瘤足蕨在那里在种类上和多度上都比其他島屿为貧乏，只有在半島北部的高山才有較平原为多的种类出現。这个分布的規律性在中国境內也同样存在，可从附表（見本文127頁）得到証明。从这个表上可以看到云南、特别是它的西部和东南部高山森林区是本屬种类的集中点，这里現已發現了18种，而其中11种屬于灰背瘤足蕨群，4种屬于奇数瘤足蕨，2种屬于合生瘤足蕨群，而仅有一种屬于最年輕的龙骨軸瘤足蕨群，后三群在中国东南部山区有較大的發展，但第一群的代表在东南部則几乎完全絕迹，因海拔較西南为低，水热条件、特别是大气湿度低，不适于古老的灰背瘤足蕨的生存。

四、瘤足蕨屬的生态特性

前面已經說过，虽然瘤足蕨主要是个热带和亚热带地区的蕨群，但它对生活环境条件的要求，却不完全同于分布內的許多其他蕨屬，它不能忍受热带的夏季高温，相反的，它是喜欢生长在热带和亚热带高山森林蔭蔽下的清凉潮潤弱酸性森林腐植質土壤的蕨类，一般都在海拔700—2,300米，或者在赤道两側地区高达3,000米以上，在平原和丘陵地区是絕無仅有的。在另一方面，本屬也不能忍受严酷的冬季低温，除日本瘤足蕨能向北分布到北海道（北緯42°）外，其他种类都在热带，亚热带地区。

生活在这样陰湿的环境下，为保証孢子的有效散布，瘤足蕨如同其他一些在分类系統上并無亲緣关系的蕨屬一样，如实蕨屬(*Bolbitis*)，沙皮蕨屬(*Hemigramma*)，刺蕨屬(*Egenolfia*)等，它的叶丛有那狹窄而有长柄的孢子叶高聳直立于叶丛中央，以便保証受到較充分的日光，因此有較好的机会在干燥的空气中来散布它的孢子。这种机会在林下陰湿的环境下是不可能享有的。

瘤足蕨适应它的特有生境条件的另一种方法是当它的嫩叶出土开放时，遍体复盖着一厚層粘性的絨毛——嫩叶表面上的腺体細胞的分泌物。它的功能，一般被認为是帮助排泄体內过多水分的一种手段，因为在幼叶沒有完全开放前，植物体的蒸騰作用的速度，受到中軸不透水的坚硬外壳和林下潮湿空气的双重障碍，这对瘤足蕨的必要的生理活动是非常不利的。

如众所周知，瘤足蕨的中軸的外面，一般是由坚硬而不透水的厚壁組織构成的外壳，作为机械支柱所包围着。在这种情况下，为了保証体內生活着的薄壁組織获得通气作用进行的机会，就很有必要从叶柄基部起發生气囊体——气体交換的器官。有趣的是，除与植物体积的大小有关外，这些气囊体的数目和形体的大小与中軸外部不透水的厚壁組織

的外壳的坚硬程度有着密切的相互关系，并且还随着組成本屬的不同种系群而有变化。在前面已經討論过的本屬原始类型的灰背瘤足蕨群（如 *P. pycnophylla* 和本屬的其他相近的一些种）的中軸，有本屬最坚硬的厚壁組織的外壳，因此，不但它的叶柄的膨大基部两外側面各有一縱列的 4—5 个或較多的較大的气囊体，而且叶柄和叶軸两側通体也各有一排的气囊体，在叶軸上的气囊体位于羽片与叶軸着生处的下面，如同在金星蕨屬的 *Thelypteris xylodes* (Kze) Ching 和相近的种类所見到的那样。在另一方面，在进化上显然是后来的种系群，如龙骨軸瘤足蕨群中的倒叶瘤足蕨（*P. Dunnii* Copel.）、耳形瘤足蕨（*P. stenoptera* Diels）等，它們的中軸比其他三个群的質地都要柔軟得多，叶柄基部也不为明显的膨大，它的两外側面有少数不大显明或者退化的小的气囊体外，叶柄上部及叶軸是从不見有气囊体出現的。奇数瘤足蕨群的气囊体在数目和大小上均較合生瘤足蕨群为發达，在有些大型种类上（如 *P. maxima* C. Chr.），其叶柄上部，甚至叶軸上也都有气囊体，而在合生瘤足蕨群則仅生于叶柄基部，数目旣少，形体也小，有时竟不很明显。

前面已經指出，瘤足蕨屬和紫萁蕨屬（*Osmunda*）之間共同特征之一，是幼叶体被复着粘性的絨毛，不久往往脱落，但在瘤足蕨屬的这粘性的絨毛的厚薄度同样地和中軸的坚硬度有着相互关系的，即在灰背瘤足蕨群最多，在个别的种几乎是半宿存的，而在龙骨軸瘤足蕨群則甚輕微。其他两群的幼叶时期的絨毛的厚度則一般介于第一和第四两群之間。此种情况是生物有机体的成对性状的平行进化的生动例子。这是瘤足蕨屬中軸坚硬度不同所引起的現象，也可以說明各个种系群的相对原始性。因此，瘤足蕨屬中軸的坚硬性不仅有生物学上的意义，而且也有进化上的重要性。

从近年来在各地，特别在中国發現了为数不少的瘤足蕨的种类这一事实看，可以判定尽管本屬有了相当古老的历史發展过程，但各个种系群在进化上仍然是相当活躍的，而其中被認为是比較原始类型的灰背瘤足蕨群在这方面仍然居于領先地位。

五、瘤足蕨屬的系統分类

Plagiogyria Mett., Farngat. II. Plagiogyria in Abh. Senkenb. Naturf. Ges. **2**: 275. 1858; Christ, Farnkr. d. Erde 175. 1898; Bedd. Ferns Brit. Ind. 51. 1865; Handb. Ferns Brit. Ind. 129.1883; Diels in Engl. u. Prantl, Nat. Pflanzenfam. **1**: iv. 282. 1899, C. Chr. Ind. Fil. 495. 1905; Suppl. III. 140. 1936; Hayata, Ic. Pl. Form. **8**: 151. 1919; Bower, The Ferns, II. 274. 1926; Nakai in Bot. Mag. Tokio **42**: 204. 1928; Hand-Mzt. Symb. Sin. **6**: 38. 1929; Copel. in Phil. Journ. Sci. **38**: 377. 1929; Tard. et C. Chr. in Fl. Gen. Indo-Chine **7**: 74. 1939; Posthumus, Varenflora voor Java 31. 1939; Holttum, Fl. Mal. II. Ferns 111. 1954.

Lomaria Bl. Enum. Pl. Jav. Fil. 205. 1828; Clarke, Ferns North. Ind. 172. 1880; Baker in Journ. Bot. **1888**: 226.

Lomaria § *Plagiogyria* Kunze in Bot. Zeit. **1849**: 865; Hook. Sp. Fil. **3**: 2. 1860: Hook. et Bak. Syn. Fil. 182. 1874.

Acrostichum Wall. List n. 23. 1828.

Stenochlaena J. Sm. in Hook. Journ. Bot. **4**: 149. 1841; Christ in Lecomte, Not. Syst. **1**: 48. 1909.

陆地生中型蕨类植物。根状茎短粗直立，圆柱状，幅射对称式，不具鳞片或真正的毛；叶簇生顶端，直立，有柄，二型，叶柄长，基部膨大、三角形，为托叶状，腹部扁平，背面中部隆起，两侧面各有 1—2 个或成一縱列的几个疣状突起，叫做气囊体，有时上升至叶柄或叶軸，叶柄基部以上或为三角形（下面为龙骨形）或为四方形（下面圆形），幼时同叶片通体有粘性的密絨毛复被，但不久受干脱落，極少半宿存，两側有边，上升达叶軸的大部，基部横切面有一个 V 字形的維管束，两側反向张开，或者分裂为三个維管束；不育叶片披針形到卵状长圓形，一回羽状或羽状深裂达叶軸，頂部羽裂合生，漸尖头，或具一頂生羽片，同下部側生羽片多少相似；羽片多对，分离或合生，有时基部上延，披針形或多少为鐮形，开展或下部几对多少下向或平展，全緣或至少頂部有鋸齿，漸尖或漸尾尖头；叶脉分离，从中肋两側向外达于叶边或鋸齿、单脉或分叉、开展，通常两面特显；叶为草質或厚紙質、少为革質，光滑，在許多种类的羽片基部下方，有一个明显的疣状气囊体。能育叶直立于植株的中央，具較长的柄，通常为三角形；叶片較短，强度收縮，羽片彼此远离，綫形，寬一般 2—3 毫米，常为彎弓形或通直，孢子囊群为亚叶边生，位于分叉叶脉的肥厚小脉上，幼时分离，成熟后匯合成片，滿复羽片下面，幼时为特化的干膜質的反卷叶边所复盖，但以后被成熟的孢子囊群推开；孢子囊为水龙骨型，但有完整而斜生的环带，由 20—24 个加厚細胞組成，具长柄，由 5—6 縱列的細胞組成；孢子每囊 68 个，四面型，具 4 个突出的边，光滑透明。

本屬是一个很自然的蕨屬（科），但在系統分类系統上是一个孤立的屬（科），在现代蕨类植物界还找不到亲緣相近的科屬；大約有 50 个在形体上相近的种，其中約有 9 种产热带中部美洲，一种产澳洲东北部昆斯兰，其余的种分布在亚洲东南部，向西达于印度北部（喜馬拉雅山），而以中国西南部山区为發展中心，已發現二十多种。

本屬在自然状态时的一个特点是它的能育叶比不育叶具有較长的柄，高聳直立于植株中央，而周围的許多較短的不育叶則略向外傾斜，这样的排列对生长于陰湿环境的瘤足蕨無疑是散布孢子的一种适应现象。

虽然本屬在种类組成上是个同型的蕨群，但按照它們的形态特征可分为如下两个組：

I. **眞正瘤足蕨組**：叶体一般为闊卵状披針形或长圓形，頂部或为奇羽状或为羽状深裂，側生羽片分离或者羽片基部多少合生上延，一般向叶之基部不縮短，厚紙質，有时为革質，叶柄基部为显著膨大，而且两外側面通常具有大的气囊体，往往上达叶柄和叶軸，生于羽片基部下方；叶軸下面扁圓或为方形；叶柄基部横切面具一个維管束。本組又可分为下列三个亚組：

(1) **奇数瘤足蕨亚組**：叶通体为奇数羽状，下面常为綠色，羽片分离，下部的还具短小柄，有时近頂部的羽片多少合生，頂生的几枚分离羽片和下面側生的同大或略小；气囊体多数而明显，有时自基部向上沿叶柄两側分布到叶軸。

(2) **合生瘤足蕨亚組**：叶下部为羽状，向頂部为羽裂、即上部羽片漸小而合生、下部羽片基部为不等形，多少上延合生，叶下面綠色少有白粉，叶柄基部两外側面的气囊体少数，往往不很显著，并从不向上沿叶柄分布。

(3) **灰背瘤足蕨亚組**：叶下部为羽状，向頂部为羽裂，下部羽片的基部上下两方相等并具短小柄，不上延，叶下面或为淡綠色，或为灰綠色，或为粉白色；气囊体大而显著，常自

叶柄的膨大基部向上沿叶柄两側达于叶軸，生于羽片基部下方。

II. **龙骨軸瘤足蕨組**：叶一般为闊披針形，通体羽状深裂达于叶軸、羽片基部等闊，合生，下部几对往往多少縮短而下向或变为小耳片，草質或薄草質，下面常为綠色；气囊体少数，不明显或退化，仅生于不甚显著膨大的叶柄基部。叶柄和叶軸下面为龙骨形；叶柄基部横切面具三个維管束。

中国瘤足蕨屬的种之检索表

1. 叶体一般为闊卵状披針形或長圓形，或为奇数羽状或者下部为羽状，向頂部为羽裂漸尖头，下部羽片一般不縮短，厚紙或革質，叶柄基部两外側的气囊体一般大而明显，往往向上沿叶柄两側达于叶軸，生于羽片基部下方，叶柄坚硬，骨質，上部及叶軸下面为圓形或几为方形。
 2. 叶体为奇数羽状，頂生的羽片和側生的同形（或者有时近頂部的羽片較小并多少合生）。
  3. 植物体形高大，高过一米，叶柄粗达7—10毫米，气囊体大而明显，自叶柄基部向上分布达于叶軸；羽片長达15—30厘米。
   4. 羽片頂端下部的边緣有鋸齿，基部圓楔形。
    5. 羽片長15—20厘米，寬約1.7厘米，叶为薄紙質……………1. 尾叶瘤足蕨（*P. grandis*）
    5. 羽片長达30厘米，寬2厘米或过之，叶为革質…………………2. 大瘤足蕨（*P. maxima*）
   4. 羽片頂端下部的边緣为全緣，基部楔形……………………3. 全叶瘤足蕨（*P. integripinna*）
  3. 植物形体远小，叶柄粗約3毫米，气囊体在叶柄基部以上不發达，在叶軸上缺如；羽片一般長达14厘米，寬达1.5厘米。
   4. 植物体高約35厘米（包括長达15厘米的叶柄）；羽片寬不及1厘米，向楔形基部漸狹………………………………………………………………4. 桃叶瘤足蕨（*P. attenuata*）
   4. 植物体較高，叶柄長过27厘米；羽片較寬，向圓形或圓楔形基部不为漸狹。
    5. 羽片長达7厘米，披針形，边緣通体有鋸齿…………………5. 武夷瘤足蕨（*P. chinensis*）
    5. 羽片一般長10厘米或較長，多少为披針状鐮形，頂端以下的边緣为全緣……………………………………………………………………6. 华中瘤足蕨（*P. euphlebia*）
 2. 叶体頂部为羽裂合生，漸尖头，少为尾尖。
  3. 叶柄基部以上不具气囊体，下部羽片基部楔形并分离，但無柄，或者上方多少沿叶軸上延。
   4. 羽片自基部一对起，其基部上方为显著上延，下部几对羽片下向。
    5. 叶体下面为粉白色，下部几对羽片縮短并且强度下向………7. 峨嵋瘤足蕨（*P. assurgens*）
    5. 叶体下面为綠色，基部一对或两对羽片不縮短或几乎不縮短，并且略下向。
     6. 叶体一般長过30厘米；羽片为漸尖头，鐮形，叶脉分叉……………………………………………………………………8. 鐮形瘤足蕨（*P. distinctissima*）
     6. 叶体長达20厘米；羽片短而鈍头或急尖头，不为鐮形，叶脉不分叉……………………………………………………………………9. 小瘤足蕨（*P. yunnanensis*）
   4. 下部羽片分离或基部上方上延，一般为水平开展或有时略下向。
    5. 下部羽片分离，基部楔形。
     6. 羽片寬1.4厘米，漸尖头，边緣具波状鋸齿，厚紙質，叶脉上下两面很显明……………………………………………………………………10. 两广瘤足蕨（*P. liankwangensis*）
     6. 羽片寬达1厘米，頂部短漸尖或急尖头、全緣，革質，叶脉上面隐約，下面不很明显………………………………………………………………11. 海南瘤足蕨（*P. hainanensis*）
    5. 下部羽片的基部下方为楔形，分离，上方多少上延。
     6. 頂端一枚合生羽片和下部的羽片同形（叶体为尾尖）。

7. 羽片为漸尖头，下部几对为鐮形，頂端以下的边緣为全緣，頂部一枚羽片不比下部側生羽片为长……12. 华东瘤足蕨 (*P. japonica*)

7. 羽片为短漸尖头或亚急尖头，都为披針形，頂端以下的边緣通体有銳鋸齿，頂部一枚羽片明显地长过于下部側生羽片……13. 縉云瘤足蕨 (*P. caudifolia*)

6. 叶体頂部羽裂，漸尖头，不具一枚和下部羽片同形的頂生羽片；下部羽片为披針形或亚鐮形。

7. 羽片长4—5厘米，寬达1厘米，边緣自基部以上有粗鋸齿……14. 岭南瘤足蕨 (*P. subadnata*)

7. 羽片长7—9厘米，寬1.2厘米，頂部以下的边緣为全緣……15. 瘤足蕨 (*P. adnata*)

3. 叶柄及叶軸两側通体均具明显黑色的气囊体，在叶軸上的气囊体是位于羽片基部下方，下部羽片分离，基部等形，上方不上延。

4. 叶体下面为綠色，或少为灰綠色。

5. 中部羽片长約6.5厘米或更短，基部寬9毫米，截形，較上部为寬，下部羽片逐漸縮短并且下向，基部的羽片退縮成为三角状耳形，长約1—2厘米……16. 短叶瘤足蕨 (*P. decrescens*)

5. 下部羽片远較长，披針形，略較上部的为短。

6. 羽片頂部以下边緣为全緣或亚全緣，革質，披針形，漸尖头，长約9厘米，寬1.2厘米……17. 大理瘤足蕨 (*P. taliensis*)

6. 羽片通体有鋸齿。

7. 羽片长9厘米，寬1.3厘米，亚鐮形，頂端鈍漸尖而且有粗大鋸齿……18. 尖齿瘤足蕨 (*P. simulans*)

7. 羽片远較长，寬1.5厘米或較寬，披針形，頂部为长尾尖，并具小鋸齿。

8. 叶柄和叶軸在成熟时密被宿存长絨毛……19. 絨毛瘤足蕨 (*P. lanuginosa*)

8. 叶柄和叶軸在成熟时变光滑。

9. 羽片长約12厘米，基部为寬斜截形……20. 滇西瘤足蕨 (*P. communis*)

9. 羽片长13—20厘米，基部圓形或楔形。

10. 羽片长13厘米，基部楔形，边緣有尖鋸齿……21. 怒江瘤足蕨 (*P. virescens*)

10. 羽片长16—20厘米，基部圓形。

11. 羽片长20厘米，寬2厘米……22. 大叶瘤足蕨 (*P. gigantea*)

11. 羽片长达16厘米，寬1.4厘米。

12. 叶为革質，下面灰綠色，边緣通体具显著的尖鋸齿……23. 景东瘤足蕨 (*P. coerulescens*)

12. 叶为草質或厚紙質，上下两面綠色，边緣具低鋸齿……24. 披針瘤足蕨 (*P. lineata*)

4. 叶体下面多少为粉白色或灰白色。

5. 叶体下面为粉白色，頂生一枚羽片通常与下部側生羽片同形，产台灣……25. 台灣瘤足蕨 (*P. formosana*)

5. 叶体下面为灰白色，頂部为羽裂，不具与下部側生羽片同形的一枚羽片。

6. 叶体小，中部寬不过10厘米，基部羽片长2—3厘米，中部羽片长5—6厘米或更短，短漸尖头或漸尖头，边緣具低鋸齿……26. 粉背瘤足蕨 (*P. media*)

6. 叶体中部寬約20厘米，基部羽片长过6厘米，中部羽片长10厘米，頂端为漸尖长尾状。

7. 羽片边緣具低鋸齿……27. 灰背瘤足蕨 (*P. glaucescens*)

7. 羽片边緣具明显的尖鋸齿………27. 尖鋸灰背瘤足蕨（*P. glaucescens* var. *arguta*）

1. 叶体照例为闊披針形，羽裂达叶軸，側生羽片基部上下方等寬，合生，基部几对羽片强度下向或退縮为圓耳形；草質，气囊体只生于稍为膨大的叶柄基部，少数或退化，叶軸同叶柄質地不为坚硬，而为草質，通常下面为銳龙骨形（即横切面为三角形）。

2. 羽片边緣有不規則的二重鋸齿，叶軸下面略为扁平或上部为龙骨形。

3. 日本种，中軸下面不为显著龙骨形，下部羽片逐漸縮短并且下向；能育叶的羽片無柄……………………………………………………………………28. 日本瘤足蕨（*P. Matsumuraeana*）

3. 中国种，叶軸下面为龙骨形，下部羽片逐漸退縮成为有条裂的小耳形；能育叶的羽片有明显的柄……………………………………………………………………29. 貴州瘤足蕨（*P. argutissima*）

2. 羽片边緣为全緣或有单鋸齿，叶軸下面通体为龙骨形。

3. 基部一至多对羽片突变为互生的圓形小耳片；叶柄短，（通常长5厘米）……………………………………………………………………30. 耳形瘤足蕨（*P. stenophylla*）

3. 基部数对羽片不为突变形而与上部的同形，通常略縮短并且强度下向；叶柄較长（通常长10厘米或更长）。

4. 叶体卵状长圓形，长15—20厘米，羽片約15对，頂端以下的边緣为全緣……………………………………………………………………31. 华南瘤足蕨（*P. tenuifolia*）

4. 叶体为披針形，远較长，羽片对数更多。

5. 羽片长达4厘米，寬5毫米，边緣通体有鋸齿，叶脉自基部分叉……………………………………………………………………32. 狹叶瘤足蕨（*P. angustipinna*）

5. 羽片长5—6厘米，寬7—9毫米，頂端以下边緣为全緣，叶脉自基部以上分叉……………………………………………………………………33. 倒叶瘤足蕨（*P. Dunnii*）

1. 尾叶瘤足蕨

Plagiogyria grandis Copel. in Journ. Phil. Sci. 38: 389 t. 1. 1929; C. Chr. in Bull. Dept. Biol. Sunyatshan Univ. No. 6. 13. 1933; Ind. Fil Suppl. 141. 1936.

Stenochlaena Henryi Christ in Lecomte, Not. Syst. 1: 48. 1909.

Plagiogyria euphlebia (non Mett.) Wu, Wong et Pong in Bull. Dept. Biol. Sunyatshan Univ. No. 3. 224 t. 103. 1932.

本种模式标本*采自貴州定番县（Cavalerie 号碼 50），以后在貴陽，云南东南部，广西和越南等地都有發現。其实本种早在1909年 Christ 氏根据 A. Henry 氏在云南东南部的蒙自山区所采标本已定名为 *Stenochlaena Henryi* Christ, Copeland 氏显然并不知道，因为他沒有提到这一点，但 Christ 氏的这个双名，如果轉变为瘤足蕨时，按照国际命名法的規定，已为 *P. Henryi* Christ 所优先占用而成为废弃名了，因此 Copeland 氏的双名是有效的。

根据模式标本看，本种是个頗为明显的大型蕨种，其不育叶的柄长达40厘米，基部膨大为三角形，两外側面各有3—4个大的气囊体外，叶柄通体也有較小的气囊体分布，叶片长达60厘米，寬25—30厘米。在一般外形上，本种極似华中瘤足蕨（*P. euphlebia* Mett.），但体形远較大，远較粗壮，有更多对的無柄羽片（达15对），厚紙質，中部的长达20厘米，基部的較短，寬約1.7厘米，頂部为尾状，边緣从楔圓形基部向上有驟尖头的齿牙，叶柄及

* 为了精簡篇幅本文所引証标本的采集人，地点等記載詳見英文之部。

叶轴均有气囊体分布，但今后在更丰富的标本材料面前，本种可能是地理分布广阔的华中瘤足蕨的一个变种，叫作 var. ***triquetra*** (Wall.) Ching, comb. nov. (*Acrostichum triquetrum* Wall.)；因为采自中国西部及喜馬拉雅山区的大多数标本其形体比中国东部产的华中瘤足蕨为大，并且干后为淡黑色或深蓝色，而在形体上也恰接近本种。

2. 大瘤足蕨，圖版二十八，1 和 2。

Plagiogyria maxima C. Chr. in Bull. Mus. Paris II. 6: 105. 1934; Ind. Fil. Supll. III. 141. 1936; Tard. et C. Chr. in. Fl. Gen. Indo-Chine 7: 73. 1939.

本种模式标本采自北越的与云南东南部接壤的 Chapa 地方，以后在云南东南部屏边县的大围山两次發現。

这是个独特的蕨种，也是奇数瘤足蕨亚組的最大的一种，比之前种的形体更为粗壮高大，它不同于前种者为其有粗如手指的叶柄，有大約 20 对的大羽片，长 20—30 厘米，寬 2 厘米，革質，边緣通体有齿牙状的鋸齿和分叉短的叶脉。

中国的标本完全同越北的模式标本一样。

3. 全叶瘤足蕨，新种。圖版二十九，1 和 2。

Plagiogyria integripinna Ching, sp. nov.

高大植株，叶柄下部缺如，柄长可能达 30—40 厘米，粗达 7 毫米，通体具有互生的大气囊体，叶片长达 90 厘米或过之，寬 40 厘米，卵状长圓形，奇数羽状，側生羽片 20—25 对，互生，开展，分离，無柄，相距約 4 厘米，綫状披針形，中部的长达 23 厘米，基部的稍短，长漸尖头，頂端为綫形，长 2—5 厘米，基部圓楔形，全緣，惟向頂部稍有浅波状鋸齿，基部下方生有大气囊体，向叶頂部的羽片漸較短，长 10—13 厘米，基部为楔形，上下两方略为合生，厚紙質，两面均为綠色；叶脉几为直角开展，分叉，少为单脉，下面明显。能育叶长等于不育叶，叶軸有棕色絨毛复盖，羽片彼此远离，长 20—23 厘米，寬 2.5 毫米，綫形。

云南：屏边县，大围山，馮国楣 *232*(**模式标本**)。

本新种頗似同地产的大瘤足蕨，但其羽片較狭，全緣和叶質远較薄，故易区别。

4. 桃叶瘤足蕨，新种。圖版三十，1。

Plagiogyria attenuata Ching, sp. nov.

不育叶的柄长 14 厘米，細瘦，叶片长 20 厘米，寬 14 厘米，奇数羽状，側生羽片 7 对，形同頂生一枚，向上斜出，长約 10 厘米，中部寬 1 厘米，狭披針形，向上下两端漸变狭，頂端漸尖，有齿牙，基部为狭楔形，有小柄，边緣有不明显的波状小齿牙，革質，干后为深棕綠色，叶脉开展，分叉或单脉，两面頗显明，能育叶的柄长 30 厘米，叶片长 15—20 厘米，羽片寬約 2 毫米，綫形，子囊群匯合，肉桂色。

广东：惠陽县，蓮花山，蓮花寺，曾怀德 *25526*(**模式标本**)，1935 年 8 月 11—31 日，生杂木林下，普通。

本新种極似华中瘤足蕨，但形体矮小而細瘦，側生羽片較少，狭披針形，长仅达 10 厘米，寬 1 厘米，向基部漸狭，故易区别。

Copeland 氏曾認为广东的植物和菲律宾的 *P. christii* Copel. 同屬一种，是錯誤的。

5. 武夷瘤足蕨，新种。圖版三十，2。

Plagiogyria chinensis Ching, sp. nov.

根状茎短粗而直立，叶多数簇生，不育叶的柄长 25 厘米，細瘦，横切面为三角形，不育叶片长 25—30 厘米，寬 10—12 厘米，奇数羽状，側生羽片 10—12 对，互生，与頂生一枚同形，彼此相距約 2 厘米，基部的与中部的等长，长 8 厘米，寬 1.4 厘米，綫状披針形，斜向上，頂部为短漸尖，基部圓楔形，有小柄，边緣为亚全緣或在頂部以下有不明显的小鋸齿，頂部羽片較短，無柄或略合生，但基部不上延，厚紙質，干后为黃綠色，光滑；叶脉开展，分叉，或有时为单脉，上下两面明显。能育叶的柄长 40—60 厘米，羽片长 5—10 厘米，寬約 3 毫米，綫形。

福建北部：崇安县，武夷山，喜峰岭，福建科学研究所，标本無号碼，1952 年 8 月 16 日 (**模式标本**)。

本新种为华中瘤足蕨种群的一个有趣的新增加，它不同于华中瘤足蕨之处为其体形远較小而細瘦，羽片远較短，而且基部几对都指向上方；与前种不同之点为其較寬的羽片有圓楔形的基部，較短的漸尖头和較薄的叶質。

6. 华中瘤足蕨　圖版三十一，1。

Plagiogyria euphlebia (Kze.) Mett. Farngatt. Plagiogyria 10, n. 6. 1858; Makino in Bot. Mag. Tokio **8**: 334. 1894; Diels in Engl. u. Prantl, Nat. Pflanzenfam. **1**: iv. 282. 1899; Christ in Bull. Acad. Géogr. Bot. Mans **11**: 232. 1902; Matsumura, Ind. Pl. Jap. **1**: 332. 1904; C. Chr. Ind. Fil. 495. 1905 (pro parte); Hayata, Ic. Pl. Form. **4**: 239. 1914; Hand-Mzt. Symb. Sin. **6**: 38. 1929; Ogata, Ic. Fil. Jap. **4**: t. 184. 1931; DeVol, Ferns East. China 57. 1945.

Lomaria euphlebia Kze. in Bot. Zeit. **1848**: 521; Hook. Sp. Fil. **3**: 20. 1860; Hook. et Bak. Syn. Fil. 183. 1868 (pro parte).

Acrostichum triquetrum Wall. List n. 23. 1828 (nom. nud.).

Plagiogyria triquetra Mett. l. c. n. 5.

Stenochlaena triquetra J. Sm. in Hook. Journ. Bot. **4**: 149. 1841 (non. nud.); Presl, Epim. Bot. 165. 1849.

本种模式标本采自日本，Kunze 氏名之为 *Lomaria euphlebia*，以后在我国云南、四川(峨嵋山)、貴州、湖南、江西、福建、广东、浙江南部和台灣等地多有發現；印度北部，緬甸和朝鮮南部也很普通。

本种的特征为其較大的奇数羽状的叶片有 7—17 对羽片，和頂生一枚同形，长 10—15 厘米，寬 1.2—1.5 厘米，基部为圓楔形，頂部以下为全緣或亚全緣。

上面已經指出，中国西部和印度北部的标本形体一般較华东及日本产的为大，而且干后不为黃綠色而为淡黑色或蓝綠色，下部羽片彼此远离，这可以作为一个地理的变种，***P. euphlebia*** (Kze.) var. ***triquetra*** (Wall.) Ching 看待。

7. 峨嵋瘤足蕨

Plagiogyria assurgens Christ in Bull. Soc. Bot. Ital. **1901**: 293; C. Chr. Ind. Fil. 495. 1905; Copel. in Phil. Journ. Sci. **38**: 398. 1929; Ching, Ic. Fil. Sin. **4**: t. 155. 1937.

Lomaria deflexa Baker in Journ. Bot. **1888**: 226 (non Col. 1844, nec Liehm. 1849)

Blechnum Faberi C. Chr. Ind. Fil. 495. 1905.

本种模式标本采自四川峨嵋山，以后在峨边，雅安，二郎山等地也陆續發現，但尙未在其他省区采到，显然是四川西南部的特有种，而且是相当普通的。

在形体上本种頗似下一种，但叶之下面为粉白色，基部几对羽片略縮短并且强度下向，所有羽片基部上方强度上延；叶軸下面为不明显的龙骨形。

8. 鐮叶瘤足蕨， 圖版三十一，2。

Plagiogyria distinctissima Ching in Bull. Fan Mem. Inst. 1: 145. 1930.

Plagiogyria adnata Bedd. Ferns Brit. Ind. t. 51; Handb. Ferns Brit. Ind. 127. 1883 quoad plantae indicae borealis; Christ in Bull. Acad. Géogr. Mans 1902: 232; 1904: 111; Hand-Mzt. Symb. Sin. 6: 38. 1929.

Lomaria adnata Hook. Sp. Fil. 3: 19 t. 147. 1860; Hook. et Bak. Syn. Fil. 182. 1874 (pro parte); Clarke, Ferns North. Ind. 472. 1880.

Plagiogyria adnata var. *condensata* Christ in Bull. Soc. Bot. France 52: Mém. I. 64. 1905.

Plagiogyria adnata f. *reducta* C. Chr. Ind. Fil. Suppl. III. 140. 1936.

本种模式标本采自四川峨嵋山，甚为普通，并且广泛分布于川东、西康、貴州、云南、广西、广东、福建、浙江(杭州)、江西、湖南；日本，印度北部和緬甸也常見。

本种在命名上的混乱由来已久，远在1860年 J. D. Hooker 氏認为印度北部的植物与爪哇的 *Lomaria adnata* Blume 相同，其后 Beddome 氏(1865年) 改名为 *Plagiogyria adnata*，以后学者一直把中国和日本的植物也沿袭此名，未予注意，只有英国 Clarke 氏在1880年曾以怀疑口吻指出說：印度的"*Plagiogyria adnata* Bedd. 可能不是与爪哇的 *Lomaria adnata* Bl. 相同"，但他在他的印度北部蕨类植物志一書中仍沿用 *Lomaria adnata* Bl. 这个名詞，而未能加以进一步的澄清。其实本种与爪哇植物很少有共同之点，主要的是本种叶体远較狹，羽片約为半長，接近，为显著的鐮形，(下部几对多少下向)，基部下方为楔形，分离，而上方則沿叶軸上延至半途或有时更上延达于上面一对羽片。Christ 氏将中国植物名为 *P. adnata* var. *condensata* 不为無因。

在自然界中，本种有时与华东瘤足蕨 (*P. japanica* Nakai) 并肩而生，应予注意分辨。

9. 小瘤足蕨

Plagiogyria yunnanensis Ching in Bull. Fan Mem. Inst. 2: 186 pl. 1. 1931; C. Chr. Ind. Fil. Snppl. III. 141. 1936; Tard. et C, Chr. in Fl. Gen. Indo-Chine 7: 75. 1939.

本种模式标本采自云南东南部蒙自(大围山?)，以后在痲栗坡，四台坡(老君山)和越北的 Chapa 地方相継發現，可見为該地特有种。本种为本屬合生瘤足蕨組的最特出也是最小的一种，羽片为短披針形，鈍头或急尖头，边緣有浅波鋸齿，和不分叉的叶脉。

10. 两广瘤足蕨， 新种。圖版三十二，1。

***Plagiogyria liankwangensis* Ching,** sp. nov.

Plagiogyria adnata Wu, Wong et Pong in Bull. Dept. Biol. Sunyatshan Univ. No. 3. 220 pl. 101. 1932 (non Bedd.)

Plagiogyria intermedia C. Chr. in Bull. Dept. Biol. Sunyatshan Univ. No. 6. 13. 1933 (non Copel. 1929).

不育叶的柄長20厘米，三角形，叶片長35厘米，羽状，而頂部为羽状深裂，羽片約15对，互生，彼此分开約2厘米，無柄，披針形，几不为鐮形，基部一对長几同于上面各对，長7—9厘米，寬1.2厘米，漸尖头，边緣通体有波状齿牙，基部为楔圓形，两边相等，近頂部的

羽片合生，但基部上方不上延，草質，干后为綠色，叶脉大多分叉。能育叶的柄长 30—40 厘米，叶片长 15—25 厘米，羽片有小柄，长 5—8 厘米，寬 2 毫米。

广西东部：平南县傜山，黃志 *39304*(**模式标本**)。广东英德县滑水山也产。

本种为一个細致的种，在形体上介于华中瘤足蕨与鐮形瘤足蕨之間，而更接近于前种，但叶之頂部羽裂，不具一枚长羽片，羽片互生，披針形，通直，下部的分离無柄，基部两側为等楔圓形，边緣有有規則的齿牙，叶質較薄，故易区别。其不同于鐮形瘤足蕨之点为下部側生羽片分离，其基部上方不沿叶軸上延，基部羽片不为下向而为水平开展，叶質較薄。

11. 海南瘤足蕨，新种。圖版三十二，2。

Plagiogyria hainanensis Ching, sp. nov.

不育叶的柄长 30—35 厘米，深棕禾秆色，光滑，膨大基部的两外側面有气囊体，叶片长 30—40 厘米，寬 14 厘米，頂部羽裂，羽片 25—30 对，水平开展，披針形，接近，长 7 厘米，寬达 1 厘米，頂端为亚漸尖头或急尖头，下部 10 对分离，有小短柄，基部为闊楔形，上部的羽片基部下方分离，上方略合生，頂部的羽片基部上下方相等合生；叶脉分叉，上面不显，下面略明显，叶为革質，干后为棕綠色，上下两面光滑。能育叶未見。

海南島：产地不詳，黃志 *35530*(**模式标本**)。

本新种为一明显的种，有很多对的狹披針形的羽片，其中下部 10 对分离，并有短小柄，叶質厚而坚硬，以致表面不見叶脉，下面也不突起，很不同于其他相近之种。

12. 华东瘤足蕨，圖版三十三，1。

Plagiogyria japonica Nakai in Bot. Mag. Tokio **42**: 206. 1928; C. Chr. Ind. Fil. Suppl. III. 141. 1936; DeVol, Ferns East. China 56. 1945.

Plagiogyria adnata (non Bedd.) Luers. in Engl. Jahrb. **4**: 356. 1883; Makino in Bot. Mag. Tokio **8**: 333. 1894; Matsumra, Ind. Pl. Jap. **1**: 331. 1904; Ogata, Ic. Fil. Jap. **4**: t. 183. 1934.

Plagiogyria intermedia Copel. in Phil. Journ. Sci. **38**: 390 t. 2. 1929.

Plagiogyria euphlebia Hook. Sec. Cent. Ferns t. 89. 1861 (non Mett.).

Plagiogyria adnata var. *distans* Rosenst. in Fedde, Report. Sp. Nov. **13**: 122. 1913.

本种模式标本采自日本，其实在我国四川、貴州、湖南、广西、广东、福建、浙江、安徽等省都有分布，而且相当普通，此外台灣，朝鮮及印度北部(阿利姆)也有生长。

本种在形体上頗似鐮叶瘤足蕨，但下部許多对羽片分离，其基为等楔形，各对間的叶軸上無翅和有合生的頂生羽片一枚，长等于下方側生羽片，基部羽片水平开展，很少略为下向，故易区别。本种也近于华中瘤足蕨，并且被过去許多学者視为同种，但其羽片，彼此接近，頂部几对合生，下部羽片無柄，也易区别。

本种在形体上似为华中瘤足蕨与鐮叶瘤足蕨之間的中間种，可能还是二者的杂交种，过去学者不是把本种名为前种，就是名为后种，都是錯誤的。

13. 縉云瘤足蕨，新种。

Plagiogyria caudifolia Ching, sp. nov.

根状茎短而直立，叶簇生，不育叶的柄长 17—20 厘米，粗約 2 毫米，下面圓形，上面具縱沟槽，基部深禾秆色，膨大，两側面各具 1—2 个不發达的气囊体，或者往往極不明显，叶片长 32 厘米，寬 13—14 厘米，长圓披針形，羽状，基部不变狹，頂端有一枚长羽片，长过于

下部的羽片；羽片 14 对（根据所見标本），长 7—7.5 厘米，中部寬約 9 毫米，等于各对羽片間的距离，披針形，向多少合生的基部略变狹，短漸尖头或亚急尖头，通直，边緣自浅波状的基部以上有尖鋸齿，基部一对羽片与上边的等长，其基部下方为楔形，分离，上方略合生，叶片基部以上的各羽片基部上下两方等形合生；叶脉亚开展，大部分叉，两面明显，每脉向外达于有驟尖头的鋸齿，厚紙質，干后两面为綠色。能育叶比不育叶为高，柄长达 50 厘米，黝暗色，坚实，叶片长 30 厘米，羽片长 10 厘米，寬 3 毫米，彼此相距 2 厘米，向上斜出，有小柄，鈍头。

四川：重庆，北碚，縉云山，刘承澤等采，西南师范学院 *10035*（**模式标本**）。

本新种是个細致的种，介于华东瘤足蕨与两广瘤足蕨之間，其与前者相同之点为其也有一枚頂生长羽片，但其长竟超过下部的側生羽片，不同之点为其披針形的羽片有通直（不向上弯弓）而短漸尖头或亚急尖头，边緣自浅波状的基部向上有尖鋸齿；其与后者相异之点为其披針形的羽片有通直而短漸尖头或亚急尖头，边緣有尖鋸齿，基部楔形，上下方等形合生和叶片頂端有一枚长羽片，其长超过下部各羽片。

14. 岭南瘤足蕨，新种。

Plagiogyria subadnata Ching, sp. nov.

本新种極似瘤足蕨，但形体远較小，不育叶片长 13—20 厘米，寬 8—10 厘米，羽片 13—19 对，长 4.5—6.5 厘米，寬不及 1 厘米，鐮形，接近，水平开展，頂端为短漸尖头，基部下方收縮，上方沿叶軸略上延，边緣自基部起有粗鋸齿，坚紙質，干后为暗綠色；叶脉分叉，少为单脉，两面明显。能育的柄长超过不育叶，叶片长 7—20 厘米，寬 5—6 厘米，羽片寬 1—5 毫米，彼此相距很远。

广东：龙头山，杜与曾二人 *12099*，*12320*（**模式标本**），生溪边，广西平南县搖山也产。

本新种也近于两广瘤足蕨，但形体較小，下部羽片为鐮形，基部合生，边緣有粗鋸齿，故易区别。

15. 瘤足蕨

Plagiogyria adnata (Bl.) Bedd. Ferns Brit. Ind. 51. 1865 (excl. t. 51); Diels in Engl. u. Prantl, Nat. Pflanzenfam. 1: iv. 282 1899; C. Chr. Ind. Fil. 495. 1905 (pro parte); Posthumus, Varenflora voor Java 31. 1936; Holttum, Fl. Mal. II. Ferns 111. 1954.

Lomaria adnata Bl. Enum. Pl. Jav. Fil. 205. 1828; Hook. Sp. Fil. **3**: 19. 1860 (exc. t. 147); Hook. et Bak. Syn. Fil. 182. 1874; Baker in Journ. Bot. **23**: 103. 1885 (pro parte).

Plagiogyria rankanensis Hayata, Ic. Pl. Form. **8**: 151 fig. 80. 1919.

本种模式标本采自爪哇山地（拔海 4,000 英尺），以后發現在馬来亚群島及菲律宾都有分布，向北达海南，台灣及亚洲大陆。包括南越及中国的福建和四川重庆縉云山。

不育叶的柄长約 13—17 厘米，叶片长 30—38 厘米，寬 18—24 厘米，頂部羽裂漸尖，羽片 20 对或更多，披針形漸尖头，不为鐮形，长 12—14 厘米，寬 1—1.2 厘米，基部的长稍过于或等于中部羽片，多少向下，無柄，基部楔形，上下相等，上部的羽片多少合生，但基部上方并不沿叶軸上延，如同鐮叶瘤足蕨那样。以上的中国标本很接近爪哇的模式种。

台灣植物名为 *P. rankanensis* Hayata，其实与爪哇模式标本無大异。本种过去曾被学者們自中国大陆及印度北部多次报道过，其实是鐮叶瘤足蕨之誤。

16. 短叶瘤足蕨，新种。圖版三十三，2。

Plagiogyria decrescens Ching, sp. nov.

不育叶的柄长10—15厘米，紅紫色，叶片长30—45厘米，中部寬10—15厘米，披針形，向基部逐漸变狹，頂部为羽裂，羽片30—50对，向基部的强度短縮成为三角状耳形，长几不及1.2厘米，下向，向上方漸加长，中部的最长，达6厘米，基部最寬8毫米，披針形，無柄，向頂部为长漸尖头，基部为截形，上下方相等，下面着生处有一气囊体，边緣有急尖头的鋸齿，厚紙質，干后为黃棕色，光滑；叶脉密集，亚开展，分叉或为单脉，两面頗明显。能育叶的柄較长，羽片約30对，长6—8厘米，寬1.5毫米，彼此远离，几無小柄。

云南：西北部的 Taron-taru 分水岭，兪德浚 *20070*（**模式标本**），拔海2,600米，生林下。

本新种为灰背瘤足蕨群的最小的一种，頗为突出，其叶柄和叶軸为暗紫棕色，两側有边，下部羽片向下逐漸縮短，到基部一对，縮成长約1.2厘米的角状耳形。

17. 大理瘤足蕨，新种。圖版三十四，1。

Plagiogyria taliensis Ching, sp. nov.

根状茎粗而直立，圓柱状，有残余老叶柄基部复盖，不育叶的柄长达20厘米，棕禾秆色，横切面为三角形，有边，叶片长40厘米，寬14厘米，狹长圓形，頂部羽裂；羽片20—25对，接近，相距仅5毫米，基部一对长7厘米，上方的8—10厘米，互生，綫状披針形，漸尖头，基部楔形，有短小柄，向頂端略为合生，边緣为亚全緣或向頂部有不明显的小鋸齿，革質，光滑，上面綠色，下面淡綠色，各羽片基部下方有小气囊体；叶脉亚开展，大都为单脉，两面明显。能育叶較长，羽片长达10厘米，寬3毫米，有短小柄，鈍头。

云南：大理蒼山，中和寺，蔣英 *11604*（**模式标本**），拔海2,500米，生沟中。

本新种为地方性的特有种，形体不大，革質，其狹披針形的羽片为亚全緣，有楔形基部，背面为淡綠色，故易与灰背瘤足蕨屬的其他种类区别。

18. 尖齿瘤足蕨，新种。圖版三十四，2。

Plagiogyria simulans Ching, sp. nov.

不育叶的柄长达26厘米，下部黝黑色，上部禾秆色，坚硬，叶片长35厘米，中部寬16厘米，狹长圓形，頂端为羽裂短漸尖头；羽片約17对，有短小柄，开展，彼此以羽片的寬度分离，基部一对长7.5厘米，披針形，中部羽片长8—9厘米，寬1—1.2厘米，并为鐮形，頂端为亚鈍漸尖并有粗鋸齿，边緣有有規則的銳齿牙，基部为亚圓形，下方有大而长的气囊体，厚紙質，上面綠色，下面灰綠色；叶脉开展，分叉或单脉，达于鋸齿。能育叶的柄长于不育叶，而叶片較不育的为短（大約7—8厘米），羽片长約9厘米，寬3毫米，有短小柄，有短尖头。

云南西北部：产地不詳，李鳴崗 *1052*（**模式标本**）。

本新种的形体及叶色像大理瘤足蕨，但基部以上的羽片为鐮形，边緣有有規則的粗銳齿牙，頂端为鈍漸尖头并有粗鋸齿，故易区别。本种不同于怒江瘤足蕨之点为形体远小，基部以上的羽片为鐮形，頂端为鈍漸尖头并有粗銳齿牙。

19. 絨毛瘤足蕨，新种。圖版三十五，1。

Plagiogyria lanuginosa Ching, sp. nov.

根状茎缺如，不育叶的柄长50厘米，粗約7毫米，禾秆色，同叶軸一样有極厚的絨毛

被复，膨大基部两外侧面几不具有气囊体或極少，叶片广大，长达 70 厘米，寬为 28 厘米，长圓卵形，向基部略狹，頂部羽裂；羽片約 35 对，接近，彼此大約以羽片的寬度分离，中部的长达 17 厘米，寬 1.5 厘米或过之，亚鐮状披針形，基部下方圓形，上方斜截形，無柄，向頂端为长漸尖头，尖头长約 1.5 厘米，并有鋸齿，边緣有齿牙状鋸齿密生，尖头向前弯弓，厚紙質，黃綠色，两面光滑；叶脉亚直角开展，两面明显，或为单脉，或为分叉，达于鋸齿。能育叶的柄长达 60 厘米，同叶軸一样，也有厚絨毛被复，叶片长 40 厘米，寬 20 厘米，羽片多数，綫形，长 12 厘米，寬 2.5 厘米，有短小柄，有短尖头，子囊群黃色。

云南：麻栗坡，中台，在北越边境，馮国楣 *12788*（**模式标本**），生混林下，普通。

本新种为 *P. pycnophylla* 組的一个成員，但形体極高大，叶軸及叶柄上有宿存的灰棕色的厚絨毛密复，故易与其他相近之种区別。

20. 滇西瘤足蕨，新种。圖版三十五，2。

Plagiogyria communis Ching, sp. nov.

Lomaria pycnophylla (non Kze.) Hook. Sp. Fil. **3**: t. 148. 1860; Hook. et Bak. Syn. Fil. 183. 1867 (pro parte).

Plagiogyria pycnophylla (non Mett.) Clarke, Ferns North. India 172. 1880; Bedd. Ferns Brit. Ind. t. 52. 1865; Handb. Ferns Brit. Ind. 129. 1883; Hand-Mzt. Symb. Sin. **6**: 38. 1929; C. Chr. in Contr. U. S. Nat. Herb. **26**: 360. 1931.

根状茎粗大直立，不育叶的柄长約 30 厘米，深禾秆色，由基部向上通体都有气囊体，叶片长約 60—70 厘米，寬 20—24 厘米，卵状长圓形，頂部深裂达叶軸，短尾头；羽片多数，約 24—40 对，近生，长約 10—12 厘米，寬 1.2—1.7 厘米，披針形，無柄，开展，向頂部漸狹，变成长尾状漸尖头（尾头长約 2—3 厘米，綫形，有鋸齿），向基部較寬，上下两方略为斜切形，下面有明显的大气囊体，厚紙質或薄紙質，干后为黝綠色，光滑，边緣有小尖鋸齿密生；叶脉开展，大都为单脉，少有分叉，彼此接近，两面明显。能育叶的柄較长，羽片长約 12 厘米，寬約 2 毫米，有短尖头。

云南：貢山县，菖蒲桶，馮国楣 *7407*（**模式标本**）。

本种在云南西北部及西康西南部極为普通，向西分布到上緬甸及印度北部。

过去学者們都把本种認为与爪哇产的 *P. pycnophylla* (Kze.) Mett. 相同，正如把云南-喜馬拉雅区的灰背瘤足蕨 (*P. glauscens* Ching) 当作南洋群島产的 *P. glauca* (Bl.) Mett. 一样，其实都是不恰当的，大陆上的植物与海島上的模式标本虽有密切关系，但畢竟有很大的区別的。

21. 怒江瘤足蕨，新种。

Plagiogyria virescens (C. Chr.) Ching, sp. nov.

Plagiogyria glauca var. *viresecens* C. Chr. in Contr. U. S. Nat. Herb. **26**: 310. 1931.

云南西北部：騰冲东的瑞丽江流域的分水岭上，*J. F. Rock 7644*（**模式标本**）。

本种形体像华中瘤足蕨，如側生羽片彼此远离，中部的长达 13 厘米，寬 1.6 厘米，基部斜楔形，但羽片有长狹尖头，下面淡綠或甚至灰綠；叶脉密生，大都为单脉，达于边緣的細鋸齿，向頂部的側生羽片逐漸縮小并为合生，故易区别。所有以上特征都足以說明本种在系統發育上是趋向于 *P. pycnophylla* (Kze.) Mett. 但其叶之下面为淡綠色或灰綠色，羽片彼此远隔，基部为楔形或斜楔形，其向頂部的較短羽片与下部羽片同形。本种不同于

以上两种之点，还在于其中肋下面有一条較深的縱沟槽。是一个細致的种。

22. **大叶瘤足蕨**，圖版三十六，1。

Plagiogyria gigantea Ching in Lingnan Sci. Journ. 15: 275. 1936; Tard. et C. Chr. in Fl Gen. Indo-Chine 7: 75. 1939 (pro parte).

本种模式标本采自云南西北部的瑞丽江与怒江分水岭 (G. Forrest *25279*)，以后在大理西的漾濞及四川西南部也有發現。

在一般形体上本种頗似滇西瘤足蕨，但約大过两倍，羽片多数(約有45对)，彼此相隔2厘米，無柄，其基部的长約10厘米，中部的长16—20厘米，寬1.5—2厘米，綫状披針形，基部为斜截形，有嚙蝕状的齿牙，由此向上的边緣有牙齿状的鋸齿，叶脉密生，开展，大都为单脉。

23. **景东瘤足蕨**，新种。圖版三十六，2。

Plagiogyria coerulescens Ching, sp. nov.

强大植物，根状茎粗而直立，不育叶的柄长达30厘米，粗强，基部横切面为显著的三角形，两外側面各有气囊体4—6个，叶片长50厘米，寬26厘米，頂部羽裂；羽片35—40对，近生，相距約2厘米，亚对生，無柄，亚鐮状披針形，下部几对略短，中部的长17厘米，寬1.5厘米，基部两方为斜截形，頂部为长漸尖头，有鋸齿，边緣有銳鋸齿；叶脉大都分叉，亚直角开展，两面隐匿不显，中肋明显，下面为方形，中央有一条寬沟槽，叶軸为淡禾秆色，下面平方，在羽片着生处有大而黑色的气囊体，叶为厚革質，下面呈灰綠色。能育叶未見。

云南：景东县，無量山，徐文宣 *17*（**模式标本**），生于拔海3,000米的杜鵑丛中。

本新种为一个特出的地方种，大致与怒江瘤足蕨最为接近，因为二者的叶之下面都为灰綠色，但羽片远較长，基部为斜截形，叶为硬革質，并且叶脉两面很不明显，几乎隐匿难見，故大不相同。

24. **披針瘤足蕨**，新种。圖版三十七，1。

Plagiogyria lineata Ching, sp. nov.

不育叶的柄长50厘米，深禾秆色，叶片长1米，寬25厘米，长圓形，頂部羽裂；分离羽片約50对，相距3厘米，通直，开展，下部的略短，中部的长15厘米，寬1.4厘米，狭披針形，向頂部为尾状漸尖头，基部圓形，下方有一气囊体，边緣有銳鋸齿，草質，干后为黝綠色；叶脉大都为单脉，也有分叉的，开展，两面頗明显。能育叶的柄較长，羽片长13厘米，寬約3厘米，尖头。

云南西北部：Taron-taru 两河分水岭，兪德浚 *19982*（**模式标本**）。王啓無 *67017*。

本新种为 *P. pycnophylla* (Kze.) Mett. 群的一个成員，但形体特大，羽片为狭綫状披針形，基部圓形，彼此分离較远，故易与其他相近之种区别。

25. **台灣瘤足蕨**，圖版三十七，2。

Plagiogyria formosana Nakai in Bot. Mag. Tokio 42: 205. 1928; C. Chr. Ind. Fil. Suppl. III. 141. 1936.

Plagiogyria glauca var. *Philippinensis* (non Christ) Matsu. et Hayata in Journ. Coll. Sci. Tokio Univ. 22: 615. 1906; ibid. 25: 244. 1908.

本种为台灣特有种，在阿里山高处森林中甚为普通。

本种在形体上最近于南海群島的 *P. glauca* (Bl.) Mett., 但叶片頂端有一長羽片，長等于下部的側生羽片，这些羽片为亚鐮状披針形，叶下面有一層較厚的白粉，故易区別。本种形体变异很大，有些植物体形很小，羽片長2—9厘米，寬4—8毫米，名为 var. *angustata* Nakai。其实这不过是生于干旱生境下的一种变形。

26. 粉背瘤足蕨，新种。圖版三十八，1。

Plagiogyria media Ching, sp. nov.

不育叶的柄長10—15厘米，禾秆色，横切面为不明显的三角形，叶片为寬披針形，長25—35厘米，寬8—10厘米，頂部羽裂；羽片30—40对，接近，斜向上开展，有短小柄，基部的長2—3厘米或稍長，中部的一般5—6厘米或較短，寬8—10毫米，披針形，頂端为短漸尖头，向基部为闊圓形，上面綠色，下面灰白色或有时为灰綠色；叶脉或为单脉或分叉，两面明显，边緣有短鋸齿，亚革質。能育叶的柄長达30厘米，叶片長10厘米，羽片長3—4厘米，寬3毫米，有小柄，鈍头。

云南西北部：Taron-Taru 分水岭，俞德浚 *20914* (**模式标本**)，生竹林下，拔海3000米；在滇西貢山县，順宁县，漾濞县，大理蒼山以及四川西南部的大梁山等高山地区，均有分布。

此外，印度北部及上緬甸的怒江和梅开江分水岭也有。

本新种自云南西北部向西經上緬甸到印度北部，为一普通蕨种，其特征为体形細小，叶为披針形，有很多对披針形短漸尖头的羽片和边緣有短鋸齿。本种过去一直被学者們認为与南洋群島的 *P. glauca* (Bl.) Mett. 同种，但其实二者主要相同之点仅在于叶之下面有灰白粉，不同之点为其体形較狹小，叶片为披針形，羽片有明显的小柄，斜向上开展，基部的縮短，中部的一般長为5—6厘米，有短漸尖头，不为長漸尖头，边緣鋸齿較短。在形体上本种頗近于菲律宾产的 *P. glauca* var. *Philippinensis* Christ.

27. 灰背瘤足蕨，新种。圖版三十八，2。

Plagiogyria glaucescens Ching, sp. nov.

Lomaria glauca (non Blume) Hook. Sp. Fil. **3**: 22. 1860; Hook. et Bak. Syn. Fil. 182. 1864; Clarke, Ferns North. Ind. 472. 1880.

Plagiogyria glauca (non Mett.) Bedd. Ferns Brit. Ind. t. 90. 1865; Handb. Ferns Brit. Ind. 129. 1883; C. Chr. Ind. Fil. 496. 1905; Copel. in Phil. Journ. Sci. **38**: 393. 1929 (pro parte); Hand-Mzt. Symb. Sin. **6**: 38. 1929; C. Chr. in Contr. U.S. Nat. Herb. **26**: 310. 1931.

不育叶的柄長20—30厘米，粗而坚硬，暗禾秆色，从基部向上通体有明显的气囊体，叶片長50—60厘米或較長，寬約16厘米，長圓形，頂部为羽裂尾状；羽片45—50对，接近，小柄很短，斜向上，基部一对較上方的为短，中部的長达10—14厘米，寬1.3—1.6厘米，綫状披針形，向頂端为細長漸尖头并有鋸齿，边緣基部为波状，向上有短鋸齿，叶为略坚的厚紙質，上面綠色，下面为鮮明的灰兰色；叶脉或为单一，或为分叉，开展，两面頗明显，能育叶的柄較長，叶片長30—35厘米，寬10—15厘米，羽片長6—8厘米，寬3毫米，有短小柄，頂端为短尖头。

云南西北部：貢山县，瀾滄江与怒江分水岭，馮国楣 *7157* (**模式标本**)。**西藏**东南部也有，向西分布到上緬甸和印度北部。在滇西極为普通，向东到丽江玉龙雪山。

本新种过去学者們一直認为与南洋群島的 *P. glauca* (Bl.) Mett. 同种，但本种形体較

大，其叶之下面不为粉白色而經常为灰兰色，間为灰白色，羽片較长較寬，向上方斜出，頂端为細长漸尖头，有較厚的叶質，边緣的鋸齿較低。

正如許多学者曾經指出过那样，南洋群島的 *P. pycnophylla* (Kze.) Mett. 和 *P. glauca* (Bl.) Mett.，除掉后者的叶下面有白粉外，在其他方面非常相似，而叶下面的白粉有时也可变得很淡，呈淡蓝色云。

尖鋸齿变种，新变种。

var. ***arguta*** Ching, var. nov.

本变种不同于原种之点仅在于边緣有长鋸齿，尖头向前方弯弓，其他方面，并無二致。

本变种分布于維西，丽江，向南达于大理蒼山。

28. 日本瘤足蕨

Plagiogyria Matsumuraeana Makino in Bot. Mag. Tokio 8: 333. 1894; Matsumura, Ind. Pl. Jap. 1: 33. 1904; C. Chr. Ind. Fil. 496. 1905; Takeda in Bot. Mag. Tokio 24: 320. 1900; Nakai in Bot. Mag. Tokio 42: 192. 1928; Ogata, Ic. Fil. Jap. t. 185. 1931.

Lomaria Matsumuraeana Makino in Bot. Mag. Tokio 8: 90. 1894.

Lomaria Fauriei Christ in Bull. Herb. Boiss. 4: 666. 1896.

Plagiogyria Fauriei Matsumura, Ind. Pl. Jap. 1: 332. 1904; C. Chr. Ind. Fil. 497. 1905.

Blechnum Fauriei Tokubuchi in Bot. Mag. Tokio 11: 231. 1906.

Lomaria euphlebia var. *serrata* Baker in Gard. Chron. new ser. 14: 494. 1880.

本种为日本特有种，自中部向北分布至北海道，这是本屬唯一分布于北温带的种，根据伊藤羊氏，也产于台灣，尙待考証。

这个日本蕨种在中国和热带美洲均有它的相近种，即貴州特有的而且稀見的貴州瘤足蕨（*P. argutissima* Christ）和热带美洲的 *P. semicordata* (Presl) Christ 以及其他的种。它和新大陆的种在形态上如此相似，以致可以認为东亚种的海外侨胞。在另一方面，它和貴州瘤足蕨也非常相近，因此，这一群的植物大致自中国西南部东移經日本而到达美洲中部。这在地理分布上的一个富有意义的問題。

29. 貴州瘤足蕨，圖版三十九，1。

Plagiogyria argutissima Christ in Bull. Acad. Geogr. Bot. Mans. 20: 141. 1910; C. Chr. Ind. Fil. Suppl. I. 55. 1912; Copel. in Phil. Journ. Sci. 38: 403. 1929.

貴州：平番，Cavalerie *3392*(**模式标本**)。只采到过一次。

本种似为一个特出的但显然稀少的蕨种，至現在为止，还很少被人們知道，Copeland 氏在他的专著中引証了这个种，但他坦白的承認他并不知道此种植物，当 Christ 氏在 1910 年發現这个新种时，他就指示这是中美洲的 *P. semicordata* 的一个近亲。在中国的种类中，本种在形体上最近于耳形瘤足蕨（*P. stenoptera* Diels），特别接近于 *P. Henryi* Christ（証明是耳形瘤足蕨的一个变形），所不同者为叶柄較长，下部 4—5 对的羽片逐漸退縮成为有裂片或鋸齿的小耳形，上部羽片紧接，干后为綠色，薄草質，边緣有双重鋸齿，能育叶的羽片有小柄，而在 *P. Henryi* Christ 下部 2—10 对羽片經常突然退縮成为互生的小圓耳形和上部羽片边緣除尾尖头外为全緣。

本种在形体上和双重鋸齿上同日本瘤足蕨之关系非常密切，所不同者为其叶軸下面

为銳龙骨形，下部羽片逐漸退縮成为有裂片的小耳形和有长柄的能育羽片。

30. 耳形瘤足蕨。 圖版三十九，2。

Plagiogyria stenoptera (Hance) Diels in Engl. u. Prantl, Nat. Pflanzenfam. **1**: iv. 282. 1899; Christ in Bull. Acad. Geogr. Bot Mans **11**: 232. 1902; Matsumura, Ind. Pl. Jap. **1**: 332. 1904; C. Chr. Ind. Fil. 496. 1905; Nakai in Bot. Mag. Tokio **42**: 209. 1928; Copel. in Phil. Journ. Sci. **38**: 398. 1929.

Blechnum stenopterum Hance in Journ. Bot. **1883**: 268.

Lomaria stenoptera Baker in Journ. Bot. **1885**: 103; in Hook. Ic. Pl. **17**: t. 1644. 1886.

Plagiogyria Henryi Christ in Bull. Herb. Boiss. **7**: 8. 1899; C. Chr. Ind. Fil. 496. 1905; Copel. in Phil. Journ. Sci. **38**: 399 t. 5. 1929; C. Chr. in Contr. U. S. Nat. Herb. **26**: 309 t. 21. 1931; Hu et Ching, Ic. Fil. Sin. **1**: t. 30. 1930.

Lomaria decurrens Baker in Kew Bull. Misc. Inform. **1906**: 9.

Plagiogyria Petelotii Copel. in Phil. Journ. Sci. **38**: 399 t. 6. 1929.

Plagiogyria Matsumuraeana Hayata in Bot. Mag. Tokio **23**: 32. 1909 (non Mak.)

本种在中国分布很广，自云南，四川(峨嵋山)，貴州，广西，越南北部到台灣，琉球群岛达于菲律宾。

本种是个特出的蕨种，同时也是个变导性大的蕨种，在模式标本，叶片中部的寬仅为6.5厘米，而在 *P. Henryi* Christ，叶片中部寬达10厘米或过之，但其叶为草質，叶軸及叶軸下面为銳龙骨形，下部2—10对羽片頗为突然地退縮成为圓形互生小耳片和能育叶的羽片有一啄，故易与相近之种区别。

大形变种，新变种。

var. ***major*** Ching, var. nov.

本变种不同于原种之点在于叶片远較大，中部寬达17厘米，羽片长达9厘米，其余与原种一致。

貴州特产：蔣英 *4653* (**模式标本**)，甚为普通。

31. 华南瘤足蕨

Plagiogyria tenuifolia Copel. in Phil. Journ. Sci. sect. C. 281. 1908; Phil. Journ. Sci. **38**: 401. 1929; C. Chr. Ind. Fil. Suppl. **1**: 55. 1912.

Lomaria Matthewii Christ apud Dunn et Tutcher, Fl. Kwangtung & Hongkong 341. 1914.

广东：馬鞍山，香港对面，C. G. Matthew *51*(**模式标本**)。**台灣**也有分布。

本种是个細致的蕨种，叶片为闊卵形或长圓闊卵形，下部1—3对羽片略短，而基部一对下向，叶軸下面为銳龙骨形，边緣为全緣或有粗鋸齿，羽片长4—4.5厘米，急尖头。本种極近于倒叶瘤足蕨 (*P. Dunnii* Copel.)，所不同者为叶片短小，呈卵状长圓形，仅有15对羽片，可能是后种的一个变形。

32. 狭叶瘤足蕨，新种。圖版四十，1。

Plagiogyria angustipinna Ching, sp. nov.

不育叶的柄长13—15厘米，銳三角形，草質，叶片較长，羽裂到叶軸；羽片超过30对，下部的略短，基部一对强度下向，中部的长4厘米，寬不及5毫米，披針形，短漸尖头，水平开展，間隙寬度不超过羽片，边緣自基部向上有有規則的鈍鋸齿；叶脉大都分叉，而且經常

瘤足蕨屬在亚洲大陆上的分布（少数种达于南洋及菲律宾）

組別	群別	中名	学名	云南	四川	西康	西藏	貴州	广西	广东	海南	台灣	福建	江西	安徽	湖南	浙江	日本	朝鲜	越南	印度	緬甸	南洋	菲律宾
真正瘤足蕨組	奇数瘤足蕨群	尾叶瘤足蕨	*P. grandis*	×				×	×											×				
		大瘤足蕨	*P. maxima*	×																×				
		全叶瘤足蕨	*P. integripinna*	×																				
		桃叶瘤足蕨	*P. attenuata*							×														
		武夷瘤足蕨	*P. chinensis*										×											
		华中瘤足蕨	*P. euphlebia*	×	×			×		×		×	×	×			×	×	×		×	×		×
	合生瘤足蕨群	峨嵋瘤足蕨	*P. assurgens*		×	×																		
		鐮形瘤足蕨	*P. distinctissima*	×	×	×		×	×	×				×			×	×			×	×		
		小瘤足蕨	*P. yunnanensis*	×																×				
		两广瘤足蕨	*P. liankwangenis*						×	×														
		海南瘤足蕨	*P. hainanensis*								×													
		华东瘤足蕨	*P. japonica*		×			×	×	×		×	×	×	×	×	×	×	×		×	×		
		縉云瘤足蕨	*P. caudifolia*		×																			
		岭南瘤足蕨	*P. subadnata*						×	×														
		瘤足蕨	*P. adnata*		×						×	×	×							×			×	×
	灰背瘤足蕨群	短叶瘤足蕨	*P. decrescens*	×																				
		大理瘤足蕨	*P. taliensis*	×																				
		尖齿瘤足蕨	*P. simulans*	×																				
		絨毛瘤足蕨	*P. lanuginosa*	×																				
		滇西瘤足蕨	*P. communis*	×	×																×	×		
		怒江瘤足蕨	*P. virescens*	×																				
		大叶瘤足蕨	*P. gigantea*	×	×															×				
		景东瘤足蕨	*P. coerulescens*	×																				
		披針瘤足蕨	*P. lineata*	×																				
		台灣瘤足蕨	*P. formosana*									×												×
		粉背瘤足蕨	*P. media*	×																	×	×		
		灰背瘤足蕨	*P. glaucescens*	×			×														×	×		
龙骨軸瘤足蕨組		日本瘤足蕨	*P. Matsumuraeana*									×						×						
		貴州瘤足蕨	*P. argutissima*					×																
		耳形瘤足蕨	*P. stenoptera*	×	×			×	×			×								×				×
		狭叶瘤足蕨	*P. angustipinna*								×													
		倒叶瘤足蕨	*P. Dunnii*					×	×	×		×	×											
		华南瘤足蕨	*P. tenuifolia*							×		×												
总計				18	9	2	1	7	7	8	3	8	5	3	1	1	3	4	2	6	6	6	1	4

自基部靠近中肋处分叉。能育叶未見。

海南島：五指山，黃志 *35570*(**模式标本**)。

本新种不同于上面一种和下面一种之点为其極狹的羽片有有規則的鋸齿和叶脉分叉处很低，即靠近中肋，而其他两种的叶脉都是在基部以上分叉。

33. 倒叶瘤足蕨，圖版四十，2。

Plagiogyria Dunnii Copel. in Phil. Journ. Sci. sect. C. 281. 1908; C. Chr. Ind. Fil. Suppl. I. 55. 1912; Copel. in Phil. Journ. Sci. **38**: 402. 1929; C. Chr. in Bull. Dept. Biol. Sunyatshan Univ. No. 6. 13. 1933.

Plagiogyria Hayatana Makino in Bot. Mag. Tokio **23**: 245. 1909; Copel. in Phil. Journ. Sci. **38**: 401. 1929.

Plagiogyria Matsumuraeana Wu, Wong et Pong in Bull. Dept. Biol. Sunyatshan Univ. No. 3. t. 102. 1932 (non Makino).

Plagiogyria adnata var. *angustata* Rosenst. in Fedde, Repert. Sp. Nov. **13**: 122. 1914.

Plagiogyria falcata Nakai in Bot. Mag. Tokio **42**: 208. 1928; Ito, Ic. Pl. Form. 201. 1928 (non Copel.).

福建：延平的山地，T. S. Dunn *3934* (**模式标本**)。广东、广西、貴州、浙江、安徽南部及台灣都有分布。

本种为一特出之种，在形体上頗似耳形瘤足蕨 (*P. stenoptera* Diels)，但下部羽片不突然退縮为圓形小耳片，而与上部的羽片几乎同形，只不过强度地指向下方，能育羽片为鈍头，不为啄形，故易区别。

THE FERN GENUS *PLAGIOGYRIA* ON THE MAINLAND OF ASIA

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1. A Brief Historical Review

The name *Plagiogyria* was first proposed by Kunze[1] as a section of the old comprehensive genus "*Lomaria*" of authors on the basis of *L. euphlebia* Kze. from Japan and *L. pycnophylla* Kze. from Java. This practice was later followed by Hooker[2] and Baker. However, on the ground of the complete oblique annulus of the sporangia, the incrassate elongate receptacle of exindusiate sori and the enlarged triangular stipular-like base of the stipe bearing a row of prominent tubercles on the two lateral faces, Mettenuis[3] was the first to credit to Kunze's original sectional name *Plagiogyria* a generic rank with 5 species and place it with the family *Cyatheaceae*. Since then, the genus was accepted as natural by botanists, but with uncertain systematic position. Christ[4] placed the genus between *Pteris* and *Blechnum* of the family "*Polypodiaceae*". Diels[5] ranked it in that very incongruous group, the *Pterideae—Cheilanthinae* of the

1) Kunze in Bot. Zeit. **1849**: 865.
2) Hooker, Species Filicum **3**: 2. 1860; Hooker & Baker, Syn. Fil. 182. 1874.
3) Mettenuis. Ueber einige Farngattungen II. Plagiogyria in Abh. Senkenb. Naturf. Ges. **2**: 275 1858.
4) Christ, Farnk. der Erde 175. 1898.
5) Diels in Engl. u. Prantl: Nat. Pflanzenfam. **1**: iv. 281. 1899.

same family, and this treatment was followed by Christensen[1] practically unchanged, and it was later ranked by him as the first genus of "Polypodiaceae" in his Ind. Fil. Suppl. III. 6. 1936. F. O. Bower,[2] on the ground of morphological and anatomical pecurialities, proposed to raise the genus to a family *Plagiogyriaceae* by itself, which is now accepted with good reasons as a natural family by nearly all fern students.

The genus was treated monographically in a comprehensive but uncritical manner by Copeland[3] (1929), who recognized 33 species, of which 10 were ascribed to the Tropical Central America and the remaining 23 to the Orient, a number of his species, however, now reduced as synonyms. My recent study of the rich material of the genus on hand has recognized 33 species from the Asiatic mainland alone, including Hainan, Taiwan, Japan and Korea. So at present the genus has a total of about 50 species, of which about 42 are known in Asia. An addition of more species especially from the mountains in the southwestern part of China will most likely be forthcoming in the future.

2. The Systematic Position of Plagiogyria

Plagiogyria, a most natural group of ferns and constituting a monotypic family *Plagiogyriaceae* Bower, differs from *Polypodiaceae* and other Leptosporangiate fern families in the complete oblique annulus of the sporangia with a long stalk of 5—6 rows of cells and tetraedric spores, the generally large upright caudex provided with a stelar structure not far removed from solenostely with a V-shaped or 3 vascular bundles in the stipe, the lack of true scales, the covering of the unfolding young leaves by mucilaginous and soon deciduous woolly hairs and in the presence on the exterior lateral faces of the enlarged stipe-base of 1—2, or a row of the characteristic excrescences known as aerophores or pneumatophores, which in a number of species often extend upwards along the entire length of the hard stipe, or rachis as well. All these are outstanding primitive features of the genus, and along with these there is a sign of advance, namely, the mixed character of the elongate sori on the incrassate forking of free veins in the fertile fronds.

Morphologically, the genus *Plagiogyria* has a combination of curiously mixed and relatively primitive characters, which give the fern an external feature not far removed from the habit of " *Lomaria*" and which also suggest for it a position as a synthetic type. It is similar to *Osmunda* in stelar structure of its massive upright caudex and of the leaf trace, the swelling base of the stipe, the dense covering of the young parts by mucilaginous hairs but with no scales and particularly in the superficial elongate sori on the slightly enlarged forking of veins as in *Todea*, but differs in the sori being protected when young by modified, erosed scarious strongly reflexed margin of the fertile pinnae, the sporangial structure provided with complete oblique annulus, the sori of mixed character in origin, the small spore out-put (48) and in the invariable presence at least on the exterior lateral faces of the enlarged stipe-base of usually two rows of aerophores or pneumatophores as an organ of aeration, which often extend upwards throughout the entire length of stipe and rachis at the point of insertion of pinnae underneath. On the other hand, according to Bower (l. c.) there are in *Schizaeaceae* protostelic, solenostelic and dictyostelic types in co-existence, and all these may be seen in a single stolon of *Plagiogyria* (*pycnophylla*). Moreover, the relation to *Schizaeaceae* (*Aneimia*) is suggested by the axillary involution in the dictyostelic stem and in some degree by the structure of sporangia, but is vitiated by the superficial and "mixed" type of sori in *Plagiogyria*.

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1) Christensen, Index Filicum XLIII. 1905.

2) Bower, The Ferns II 274. 1926.

3) Copeland in Phil. Journ. Sci. **38**: 377. 1929.

The character of open venation so usual a sign in primitive ferns is shared by both *Osmundaceae* and most *Schizaeaceae* and by *Dicksoniaceae*, but the superficial sori without any true indusium point definitely to *Todea* rather than to any Schizaeoid or Dicksonioid ferns, where its origin is marginal, while the "mixed" type of sori is a feature of advance, not seen in any of the ferns from the simple type of sori without intervention of gradate condition as is evidenced within the genus *Dipteris*. In the structure of sporangia, *Plagiogyria* compares most nearly with that of *Dicksonia* and both of these may be traced in essentials to a Schizaeoid origin, such as that of *Aneimia*. The low spore out-put is a sign of advance and, in this respect, *Plagiogyria* is far removed from *Osmundaceae* or *Schizaeaceae*, but is not materially smaller than that of *Dicksonia* (64).

The sum of all these considerations leads to the conclusion that *Plagiogyria* is a relatively primitive type of ferns with an isolated position among the modern Leptosporangiate Ferns, and that its relations downwards to such families with simple sori as *Osmundaceae* and *Schizaeaceae* are not very close. Its upward relations, as suggested by Bower, to the superficial and mixed type of sori of Gymnogrammoid Ferns, such as *Cryptogramme* and *Coniogramme*, is only superficial, while its phyletic relations to both Pteroid and Blechnoid Ferns as was supposed by Hooker, Christ and Diels, is altogether too far removed.

3. The Geographic Origin and Distribution

The structural peculiarities of *Plagiogyria* suggest the genus is of considerable geological age. The great number of local species as the present study has disclosed and the focusing of these in China, is good indications that the genus is of Chinese origin, somewhere in southwest China, a fact which was first pointed out by H. Christ as early as 1902 (Bull. Acad. Géogr. Mans **11**: 232), and Copeland (Phil. Journ. Sci. **38**: 383. 1929) arrived at the same conclusion in later years. This fact is now not only verified by the presence in China of the great majority of species, but also substantiated by the existence of all the phyletic groups known of the genus in China, where it seems to have established a substantial dispersal pressure and thence the species migrate in different directions; namely, westwardly to the Himalayas, but none is known in peninsular India, southwardly to Indonesia. Toward the southeast, the genus reaches Celebes and New Guinea and farther down to Queensland in northeastern Australia in the form of *P. articulata* (Müller) Ching, which is a counterpart of *P. euphlebia*. (Kze.) Mett. from China and Japan. To the northeast, two species from East and Central China are common in Japan and Southern Korea, while the third Japanese species, *P. Matsumuraeana* Makino finds its close relative in *P. argutissima* Christ from Kweichow in the west, and a group of related American species as typified by *P. semicordata* (Presl) Christ on the other side of the Pacific Ocean. Of the 33 species so far known from the entire region under review, 32 are from China, of which 4 reach the Himalayas, 5 to Indo-China, 2 to Japan, while the 10 species known in the Malay-Polynesian region are apparently daughter species of the groups of *P. pycnophylla*, *P. adnata*, *P. euphlebia* and *argutissima*, all of which are well represented in China, while the group of *P. pycnophylla*, the oldest & the largest group of the genus, is represented by 13 species in Yunnan and its neighbourhood.

The constituent species of the four groups are as follows:

1. The group of *P. pycnophylla*:

P. communis — *P. virescens*
P. decrescens — *P. gigantea*
P. taliensis — *P. coerulescens*
P. simulans — *P. lineata*

P. lanuginosa	*P. glaucescens*
P. media	*P. formosana*

2. The group of *euphlebia*

P. attenuata	*P. grandis*
P. chinensis	*P. maxima*
P. euphlebia	*P. integripinna*

3. The group of *adnata*

P. japonica	*P. hainanensis*
P. caudifolia	*P. yunnanensis*
P. subadnata	*P. assurgens*
P. liankwangensis	*P. distinctissima*
P. adnata	

4. The group of *argutissima*

P. tenuifolia	*P. angustipinna*
P. Dunnii	*P. argutissima*
P. stenoptera	*P. Metsumuraeana*

As to the question of primitiveness of the above four groups within the genus, opinions were divided. Bower was once disposed to regard *P. semicordata* of Tropical Central America as primitive species in the genus, but, as we see now, morphological and anatomical evidences do not support this supposition, for the soft herbaceous leaf-texture, the rather soft, carinate and dry compressed stipe and rachis provided with very few or even obselete aerophores on the outer faces of much less enlarged stipe-base and the 3 vascular bundles in the stipe——all these tend to indicate the group of *P. argutissima* is of recent evolution regardless of its very wide area of distribution. On the other hand, Copeland (l. c.) was of the opinion that *P. pycnophylla* and *P. adnata* are more primitive, on the ground that the comparative wealth of the Old World, in known species as well as their diversity, indicates great age there and both of the species are widely distributed.

I agree with Copeland only in so far as *P. pycnophylla* is concerned, but not as to *P. adnata*, which, in spite of its wide distribution, seems even of a much younger age than the group of *P. euphlebia*, for which *P. maxima* is perhaps the parental type and from which *P. adnata* perhaps evolves through *P. japonica*, an exact intermediate form between the two groups. While the fourth group, *P. argutissima*, including the Japanese *P. Matsumuraeana* and the American *P. semicordata* with its relatives is the latest decent of evolution, very likely from *P. adnata* and other related species.

As an additional evidence in favour of Copeland's view-point regarding *P. pycnophylla* as being more primitive in the genus, it may be pointed out among others that this and other related species are characterized by thicker leaftexture, the hard, woody and round stipe and rachis with one single V-shaped vascular bundle in the stipe-base and prominent aerophores not only on the enlarged leaf base but also regularly distributed along the entire length of stipe and rachis——all these may be considered more primitive characters in the genus.

Geographically, each of these representative species for each group has been the apparent point of departure for the evolution of a number of daughter species: those of *P. pycnophylla*, the largest group in the number of known species, in the southern and southwestern part of the area; those of *P. euphlebia* in the east, southeast and farther down to Quensland in the form of *P. articulata*, which was erroneously reported from there by Hooker and Baker as *P. euphlebia*, with which the Northeastern Australian species looks very much alike. The group of *P. adnata*, being closely linked up with the group of *P. euphlebia* by *P. japonica*, is distributed in central, western and

southeastern part of the area, and southeastwardly to Malaya, Java and the Philippines and eastwardly to Japan and Korea. The last group, *P. argutissima*, has six species in the Orient, of which two species, *P. argutissima* in Central China and *P. Matsumuraeana* in Japan are close relatives of the only American group of *P. semicordata*, a counterpart of the Japanese *P. Matsumuraeana*, which, upon crossing the Pacific, by overland route in the north, reached America practically with little modification and, upon having established itself in the New World, developed ten or more closely related species, but there being in America no evolution of distinct groups of species, such as are evident in the Orient. This is a further evidence in favour of the Tropical Central American species of *Plagiogyria* being of recent evolution of the oriental origin.

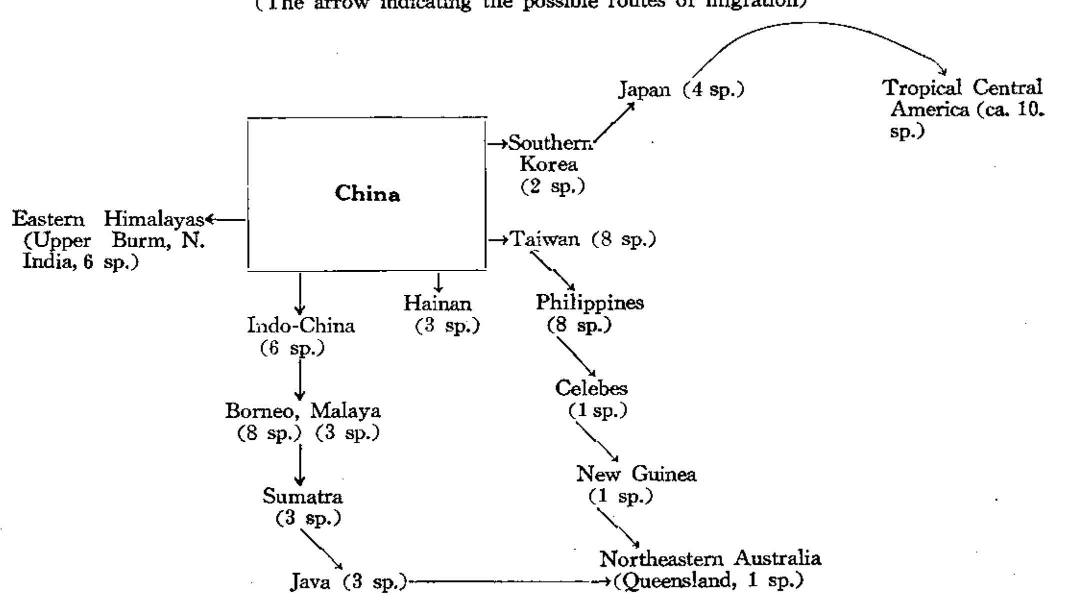
Starting from the Southwestern China as the geographical centre of origin of *Plagiogyria*, the number of species becomes less and less as they go towards different directions and the genus presently disappears especially towards the north, evidently due to a too severe climate. This regularity of thinning out with distance from the centre of origin in China breaks up only by the macro-relief of the land surface within the geographic range of the genus, for *Plagiogyria* is almost exclusively a high mountain forest fern genus in the tropical and subtropical countries, where the climate is neither too hot in summer nor too cold in winter. For this reason, in the mainland of Asia, the genus ranges northwardly as far as 30°N. Lat. only, though a single species, *P. Matsumuraeana* ranges from Central Japan northwardly as far north as Hakaido (42°N. Lat.) due to the influence of the warm currents of the Pacific Ocean.

On the other hand, Malaya, not having so much high mountain as the Philippines, Borneo and Sumatra, is poorer both in species and relative abundance in Plagiogyrias, which in the Mount Kinabalu and Korinchi Peak are much more abundant than in the lowland (holttum, 1. c.). The same principle of regularity regarding the distribution of *Plagiogyrias* in China also holds true, as is shown by the accompanying table.

The following diagram showing the possible lines of migration of *Plagiogyria* from its centre of distribution in the southwestern part of China may help to illustrate how it distribute in relation to the latitude and the land features within its range.

A Diagram Showing the Geographic Distribution of the Genus Plagiogyria

(The arrow indicating the possible routes of migration)



4. Adaptative Peculiarities of Plagiogyria

As has already been pointed out above, although *Plagiogyria* is essentially a tropical and subtropical genus, it is, nevertheless, unlike the most other genera of the area as to the nature of the habitat. It can not endure the high atmospheric temperature of the tropics. On the contrary, all the species are high mountain forest ferns, growing in the weak acid humus soil in a cool, damp and shady environment, generally at elevations of 700—2300 or even over 3000 meters above the sea level, very rarely seen in the lowland. Nor can they endure severe winter cold with the exception of one known species, *P. Matsumuraeana*, which is said to range northwardly as far as Hokaido in Northern Japan, no other species being so far reported from the temperature regions, although some species are also met with in warm temparate places in Central and East China at lower elevations than in the tropical and subtropical regions.

In order to facilitate an effective spore-dispersal under such a wet and shady environment, *Plagiogyria*, like other quite unrelated ferns, which also have specialized fertile frond, such as *Bolbitis*, *Hemigramma*, *Egenolfia*, has its leaves so arranged that the fertile narrow fronds, on longer stipe than the sterile, stand quite erect and high in the middle of the plant to insure better light and consequently a better chance for dispersal of its spores in the dry air than they otherwise could do so.

Another peculiar way of adaptation of *Plagiogyria* to its particular environment is the dense covering of the young unfolding leaves by a layer of mucilage, a secretion by glandular cells, the function of which is generally believed to be a means of excreting excessive water, its speed of transpiration being retarded both by the impervious shell of the axis previous to the full opening of the young leaves and by the wet and often quiet atmospheric air imparted by its environment. It has been known that the axis of the leaves in *Plagiogyria* is inclosed in a hard and thick sclerenchmatic shell as a mechanical support. In order to provide for the aeration of the living parenchmatic tissue beneath, there arises the necessity of developing aerophores, or pneumatophores from the base of the stipe upwards. It is interesting to note, besides the dimension of the plant, that the number and size of the aerophores is correlated with the degree of hardness of the impervious sclerenchmatic shell and varying with different taxonomical groups of the species within the genus. In the primitive group as is represented by *P. pycnophylla* and closely related species, there is the hardest sclerenchmatic shell known in the genus and the axis may have more than half a dozen large and prominent aerophores on each exterior side of the swollen stipe-base disposed in a somewhat irregular row and, in addition, similar aerophores also appear at regular intervals along the entire length of the stipe and rachis, where they are located immediately adjacent to the insertion of the pinnae in the very much same manner as *Thelypteris xylodes* (Kze.) Ching and other related species. On the other hand, in the species of apparently more recent evolution, as is represented by the group of *P. argutissima*, including *P. stenoptera*, *P. Dunnii*, *P. Matsumuraeana* and a few others, where the axis is much less hard and woody than all the other three groups, the aerophores are non-existent except at the much less dilated stipe-base, even there they are often very feebly developed, or else only with one or two small rather inconspicuous aerophores on each lateral side. The same is also true of the mucilaginous hairs, its relative thickness being likewise correlated with the degree of hardness of the axis of the leaves. This may be considered as the joint evolution of a pair of characters resulting from the varying degree of the hardness of the axis of the leaves and, consequently, the relative primitiveness of the species concerned. It is, therefore, that the degree of hardness of the axis of *Plagiogyria* has after all not only biological meaning but also evolutional significance.

Considering from the fact that the marked increase in the number of species recently discovered especially in China, it is safe to say that *Plagiogyria*, inspite of its considerable age, is still evolutionally active in all groups within the genus with the presumably primitive group of *P. pycnophylla* still leading in this respect.

5. Plagiogyria Mett.

Plagiogyria Mett., Farngat. II. Plagiogyria in Abh. Senkenb. Naturf. Ges. 2: 275. 1858; Christ, Farnkr. d. Erde 175. 1898; Diels in Engl. u. Prantl, Nat. Pflanzenfam. 1: iv. 282. 1899; Bedd. Ferns Brit. Ind. 51. 1865; Handb. Ferns Brit. Ind. 129. 1883; C. Chr. Ind. Fil. 495. 1905; Suppl. III. 140. 1936; Hayata, Ic. Pl. Form. 8: 151. 1919; Bower, The Ferns II. 274. 1926; Nakai in Bot. Mag. Tokio 42: 204. 1928; Hand-Mzt. Symb. Sin. 6: 38. 1929; Copel. in Phil. Journ. Sci. 38: 377. 1929; Tard. et C. Chr. in Fl. Gen. Indo-Chine 7: 74. 1939; Posthumus, Varenflora voor Java 31. 1939; Holttum, Fl. Mal. II. Ferns III. 1954.

Lomaria Bl. Enum. Pl. Jav. Fil. 205. 1828; Clarke, Ferns North. Ind. 172. 1880; Baker in Journ. Bot. 1888: 226.

Lomaria § *Plagiogyria* Kunze. in Bot. Zeit. 1849: 865; Hook. Sp. Fil. 3: 2. 1860; Hook. et Bak. Syn. Fil. 182. 1874.

Acrostichum Wall. List n. 23. 1828.

Stenochlaena J. Sm. in Hook. J. Bot. 4: 149. 1841; Christ in Lec. Not. Syst. 1: 48. 1909.

Terrestrial medium-sized ferns of mountain forests in tropical and subtropical to warm-temperate regions. *Caudices* short, thick, cylindrical, erect, of a radial symmetry, devoid of either scales or true hairs; *fronds* tufted at the growing tip of caudices, erect, stipitate, strongly dimorphic; stipe long, base enlarged, carinate, dorso-ventrally compressed with stipular-like edges, inner face flat, outer face convex with a ridge down the middle, bearing on each side 1—2, or a row of several excrescens known as aerophors, or pneumatophores, the upper part of stipe either triangular or quadrangular (flattened), covered when young with copious mucilaginous hairs (which become flaky upon drying,) and provided each with a narrow wing which often extend upwards to a greater length of the rachis, the stipe consisting of a single V-shaped vascular strand with the lateral sides facing away from each other which expands or sometimes divides into 3 strands; lamina of sterile frond lanceolate to ovate-oblong, simply pinnate or pinnatifid down to a narrow wing along the rachis, either provided with a free end-pinna similar to the lateral ones, or often with pinnatifid coadnate apices; pinnae usually numerous, free or adnate throughout, sometimes recurrent at the anterior base, lanceolate or falcate, patent or the lower ones more or less deflexed, entire or serrate under the invariably serrate, acuminate or caudate apices; *veins* free, run outward from the costa of pinnae to the margin or into the teeth, simple or forked, patent, generally distinct on both sides; *texture* herbaceous to chartaceous, or rarely coriaceous, glabrous, the base of pinnae underneath provided in many species with a prominent dark-colored aerophore. *Fertile fronds* stand erect in the middle of the plant, on longer stipe usually carinate throughout, lamina shorter, lateral pinnae strongly contracted, wide apart, linear, 2—3mm broad, often falcately curved; *sori* submarginal, borne on the short swollen forkings of once-forked veins, but becoming confluent at maturity, protected when young by the modified scarious reflexed margin of the pinnae, which is pushed back straight by the expanding sori; *sporangia* of the polypodioid type with a complete but *oblique* annulus of 20—24 thickened cells and a long stalk consisting of 5—6 rows of cells; *spores* 48, tetraedric, strongly 4-lobed, smooth, transluscent.

A very natural but isolated genus of about 50 closely related species, of which about 10 are in the tropical Central America, 1 in Queensland, the remaining species are eastern Asiatic with the centre of distribution in the mountain forests in South-

west China, where over 30 species have been recognized, especially rich in the high mountain forests in Yunnan.

A striking feature of the genus is the manner in which the fertile frond, on longer stipe than the sterile, stands erect in the middle of the plant, while the sterile fronds of the same plant are inclined obliquely away from them. It is no doubt an adaptation to effective spore-dispersal under the very humid environments under which all the species of the genus find themselves in nature.

In spite of the homogenous nature of the genus in its composition, *Plagiogyria* may be easily divided into two main sections as follows:

I. Sectio **Euplagiogyrae.** sect. nov. Frondibus plerisque late ovato-lanceolatis vel oblongis, aut impari-pinnatis aut apice coadnato-pinnatifidis, pinnis liberis vel inferioribus antice adnatis recurrentibusque, raro abbreviatis, textura chartacea vel interdum coriacea, basi stipitis valde incrassata et latere exteriore aerophoris tuberculiformibus magnis prominentibus donatis et saepe eisdem aerophoriis per totam longitudinem stipitis rhachisque ad insertionem pinnarum instructis, rhachi inferne tereti vel fere applanata; in basi stipitis fasciculo vasculari unico.

(1) Subsectio **Euphlebiae.** Frondibus impari-pinnatis, facie inferne semper viridibus, pinnis liberis, inferioribus breviter petiolatis, interdum supremis plus minusveleviter adnatis, pinna terminali lateralibus simili vel minore, aerophoris multis, prominentibus, nigris aut in basi stipitis aut per totam longitudinem stipitis rhachisque ad basin pinnarum praeditis.

(2) Subsectio **Adnatae.** Frondibus pinnatis infra apicem pinnatifidum, i. e. pinnis supremis sensim minoribus confluentibusque, inferioribus basi postice cuneatis liberisque, antice secus rhachim plus minusve obcurrentibus, facie inferne viridi vel rarissime albido-farinosa, aerophoris in basi stipitis paucis saepe invalidis et supra basin stipitis nullis.

(3) Subsectio **Pycnophyllae.** Frondibus pinnatis infra apicem pinnatifidum, pinnis inferioribus liberis, basi utraque latere aequalibus aut breviter petiolatis, anteriore nec recurrentibus, facie inferne aut viridi aut pruinosa aut albido-farinosa, aerophoris magnis prominentibus, saepissime e basi stipitis sursum non tantum per totam longitudinem stipitis sed etiam rhachis ad insertionem pinnarum regulariter donatis.

II. Sectio **Carinatae,** sect. nov. Frondibus plerisque late lanceolatis, ad rhachim profunde pinnatifidis, pinnis lateralibus basi late et aequaliter adnatis, infimis abbreviatis et saepe deflexis, textura herbacea vel tenuiter herbacea, facie inferne semper viridi, aerophoris paucibus, parvis vel invalidis solummodo in dorso basibus stipitis paulo incrassatis donatis, aliter carentibus, dorso stipitis rhachisque saepe acute carinato (triangulare); fasciculis vascularibus 3.

Key to the Chinese Species of Plagiogyria

1. Fronds, as a rule, broadly ovate-lanceolate, or oblong, either impari-pinnate, or else pinnate with rarely abbreviate lower pinnae, free (at least on lower side of the base) under the pinnatifid and gradually narrowed, acuminate apex, texture chartaceous or coriaceous, areophores on the lateral sides of the base of stipe generally large, prominent, and often extending upwards along the whole length of stipe and rachis at the point of insertion of pinnae; stipe hard, bony, of which the upper part and the entire rachis are round, or flattened (quadrangular in cross section) on the under side.
   2. Fronds impari-pinnate with free end-pinna similar to the lower lateral ones (or occasionly the uppermost pinnae smaller and adnate).
      3. Large plants, over a meter high, stipe 7—10 mm thick, aerophores large, prominent both on stipe and rachis, at the insertion of pinnae, which are large, 15—30 cm long.

4. Pinnae with serrated margin below apices, base round-cuneate.
  5. Pinnae 15—20 cm long, about 1.7 cm broad, texture thin chartaceous ··· 1. *P. grandis*
  5. Pinnae to 30 cm long, 2 cm or broader, texture coriaceous ······2. *P. maxima*
4. Pinnae entire under serrate apices, base cuneate··················3. *P. integripinna*

3. Plants much smaller, stipe about 3 mm across, aerophres on stipe above the base are ill-developed and absent at the base of pinnae, which are generally to 14 cm long, up to 1.5 cm broad.
  4. Plants about 35 cm high (including stipe 15 cm long), pinnae below 1 cm broad, gradually attenuate towards cuneate base·····························4. *P. attenuata*
  4. Plants taller, stipe above 27 cm long, pinnae broader, not so attenuate towards rounded or round-cuneate base.
    5. Pinnae to 7 cm long, lanceolate, margin serrate throughout······5. *P. chinensis*
    5. Pinnae generally 10 cm or longer, more or less falcate lanceolate, margin entire under serrate apices···6. *P. euphlebia*

2. Fronds with pinnatifid apical part, acuminate or rarely caudate.
  3. Stipe above the base and the entire rachis devoid of aerophores, base of the lower pinnae cuneate, and free, or the anterior side more or less recurrent along the rachis.
    4. Pinnae from the basal pair upwards strongly recurrent at the upper side of the base, basal pinnae or several lower pairs deflexed.
      5. Fronds white-farinose underneath, lower several pairs of pinnae shortened and strongly deflexed···7. *P. assurgens*
      5. Fronds green underneath, basal pair or 2 not or hardly shortened and somewhat deflexed.
        6. Fronds commonly over 30 cm long, pinnae acuminate, veins forked········ ···8. *P. distinctissima*
        6. Fronds to 20 cm long, pinnae short, obtuse or acute at apex, veins simple ···9. *P. yünnanensis*
    4. Lower pinnae free or slightly adnate by the recurrent anterior side of the base, lower pinnae as a rule horizontally patent, or somewhat deflexed.
      5. Lower pinnae free with cuneate base.
        6. Pinnae 1.4 cm broad, acuminate, margin crenate-serrate, texture chartaceous, veins distinctly raised on both sides·················10. *P. liankwangensis*
        6. Pinnae up to 1 cm broad, short-acuminate or acute, entire, texture coriaceous, veins hidden above, only vissible beneath···········11. *P. hainanensis*
      5. Lower pinnae cuneate and free at the posterior side of the base, more or less recurrently adnate at the anterior side.
        6. Apical adnate pinna similar to the lower lateral ones (frond with caudate apex).
          7. Pinnae gradually acuminate, the lower several pairs falcate, margin entire below the serrate margin, the terminal pinna not longer than the lower lateral pinnae···12. *P. japonica*
          7. Pinnae short-acuminate or subacute, all lanceolate, margin rather sharply serrate above the crenate-dentate base, the terminal pinna apparently longer than the lower lateral pinnae···························13. *P. caudifolia*
        6. Apical part of frond coadnate without distinct terminal pinna similar to the lower lateral ones, lower pinnae lanceolate or subfalcate.
          7. Pinnae 4—5 cm long, to 1 cm broad, margin from the base upwards coarsely serrate···14. *P. subadnata*
          7. Pinnae 7—9 cm long, 1.2 cm broad, margin entire below the serrate api-

ces ··································· 15. *P. adnata*

3. Entire stipe and rachis provided with prominent, dark-colored aerophores at the point of insertion of the pinnae, of which the lower ones are free, not recurrent along the rachis on the anterior side of the base.
  4. Frond green underneath.
    5. The middle pinnae about 6.5 cm long, or even shorter. 9 mm broad at the broader truncate base, lower ones gradually shortened downward and deflexed, the basal ones reduced to deltoid auricles about 1—2 cm long ······ ··························· 16. *P. decrescens*
    5. Lower pinnae much longer and lanceolate, only slightly shortened.
      6. Pinnae entire or subentire below apices, coriaceous, lanceolate, acuminate, 9 cm long, 1.2 cm broad. ··························· 17. *P. taliensis*
      6. Pinnae serrate throughout.
        7. Pinnae 9 cm long, 1.3 cm broad, subfalcate, apices bluntly acuminate and coarsely serrate ··························· 18. *P. simulans*
        7. Pinnae much longer, 1.5 or broader, lanceolate, apices attenuately caudate and serrate.
          8. Stipe and rachis densely covered with persistent long woolly brown hairs at maturity ··························· 19. *P. lanuginosa*
          8. Stipe and rachis become glabrous and naked at maturity.
            9. Pinnae about 12 cm long, with broad, oblique-truncate base ··········· ··························· 20. *P. communis*
            9. Pinnae 13—20 cm long, with rounded or cuneate base.
              10. Pinnae 13 cm long, with cuneate base, sharply toothed ·············· ··························· 21. *P. virescens*
              10. Pinnae 16—20 cm long, base rounded.
                11. Pinnae 20 cm long, 2 cm broad ··························· 22. *P. gigantea*
                11. Pinnae to 16 cm long, 1.4 cm broad.
                  12. Texture coriaceous, bluish-green beneath, margin with prominently sharp teeth ··························· 23. *P. coerulescens*
                  12. Texture herbaceous or chartaceous, concolored, margin with low teeth ··························· 24. *P. lineata*
  4. Fronds more or less white-farinose or bluish-white below.
    5. Fronds white-farinose beneath, end-pinnae generally similar to the lower lateral ones, Taiwan ··························· 25. *P. formosana*
    5. Fronds bluish-white beneath, apical part pinnatifid with linear, serrate cauda unlike the lateral ones beneath.
      6. Fronds small, below 10 cm broad at the middle, basal pinnae 2—3 cm long, middle ones 5—6 cm long, short-acuminate or acuminate, with low teeth··· ··························· 26. *P. media*
      6. Fronds 20 cm broad at the middle, basal pinnae above 6 cm long, the middle ones above 10 cm long, apices attenuately caudate.
        7. Pinnae with low teeth ··························· 27. *P. glaucescens*
        7. Pinnae with prominently sharp teeth ········· 27. *P. glaucescens* var. *arguta*

1. Fronds, as a rule, broadly lanceolate, pinnatifid nearly down to rachis with lateral pinnae equally adnate at both sides of the base, the lowest pinnae being strongly deflexed or often reduced into small round auricles, texture herbaceous, aerophores confined to the rather less dilated base of stipe, few or often rudimentary, stipe and rachis soft, herbaceous, generally sharply carinate or keeled on the back (triangular in cross section).
  2. Pinnae irregularly double-serrate, back of rachis flat or keeled in the upper part.

3. Japanese species with rachis flattened on the back, lower pinnae only gradually shortened and deflexed, fertile pinnae sessile··················28. *P. Matsumuraeana*

3. Chinese species, rachis in the upper part carinate on the back, lower pinnae gradually reduced into small lacerate auricles, fertile pinnae long-stipitate······ ··29. *P. argutissima*

2. Pinnae entire or simply serrate, rachis carinate on the back.

3. Lower 1 or often several pairs of pinnae suddenly reduced into small round and alternately disposed auricles, stipe short (generally 5 cm long)························ ··30. *P. stenoptera*

3. Lower pinnae not deformed but similar to the upper ones, often slightly shorter and strongly deflexed, stipe much longer (generally 10 cm or longer).

4. Fronds ovate-oblong 15—20 cm long, with about 15 pairs of pinnae entire below serrate apices··31. *P. tenuifolia*

4. Fronds lanceolate, much longer, with numerous pairs of pinnae.

5. Pinnae to 4 cm long, 5 mm broad, margin serrate from the base upwards, veins forked from the base··32. *P. angustipinna*

5. Pinnae 5—6 cm long 7—9 mm broad, margin entire below serrate apices, veins forked high above the base··33. *P. Dunnii*

1. **Plagiogyria grandis** Copel. in Journ. Phil. Sci. 38: 389 t. 1. 1929; C. Chr. in Bull. Dept. Biol. Sunyatshan Univ. No. 6. 13. 1933; Ind. Fil. Suppl. III. 141. 1936.

Stenochlaena Henryi Christ in Lecomte. Not. Syst. 1: 48. 1909.

Plagiogyria euphlebia (non Mett.) Wu, Wong et Pong in Bull. Dept. Biol. Sunyatshan Univ. No. 3. 224 t. 103. 1932.

Kweichow: Pin-fa, *Cavalerie 50* (type), Kweiyang, *Bodinier 2395*.

Kwangsi: Pin Nam Hsien, Yao Shan, Lo Hsiung, *S. S. Sin 185B*, in forest, 700 m alt.; Bako Shan, *R. C. Ching 7143* (typical); Bin Long, Mia Shan, *R. C. Ching 5988*, under forest, 4800 ft. alt.

Yunnan: Mengtze, mountains to the southeast, *A. Henry 9164* (type of *Stenochlaena Henryi* Christ); *A. Henry 13476* ter; Ping-Pien Hsien, Tawei Shan, *K. M. Feng 156*.

Tonkin: Chapa, *Colani 1968*, Nov. 1924.

Christ already named the species under *Stenochlaena Henryi* long before, which was apparently not known to Copeland and which is already preoccupied by *Plagiogyria Henryi* Christ, a synonym of *P. stenophylla* (Hance) Diels (vide infra).

According to the type, this is a quite distinct and large species. Stipe of the sterile frond 40 cm high, base triangular-dilated with 3—4 large aerophores on each side, which extend upwards along the stipe and often also the rachis, but smaller, lamina about 60 cm long, 25—30 cm broad. In general appearance, it is very much similar to *P. euphlebia* Mett., differs, as far as the type is concerned, in larger dimension and stouter habit, more numerous pinnae (to 15 pairs) of chartaceous texture with the middle largest pinnae to 20 cm long, while the basal ones shorter, about 1.7 cm broad with cuspidato-dentate margin from the cuneato-rounded base upwards and decidedly caudate apex, the absence of slender pedicels of pinnae and in the aerophores ranging from the base of stipe upwards along the entire length of stipe and rachis at the lower base of each pinna. Bodinier *No. 2395* agrees with the type in other respects but with rather acuminate apex of pinnae. In the presence of more ample material from the region, it may prove the species a mere ecological form of the wide-spread *P. euphlebia* Mett. var. **triquetra** (Wall.) Ching, (*Acrostichum triquestrum* Wall.) for most specimens seen from West China and the Himalayas of *P. euphlebia* average much larger than those from East China and dry blackish or olivaceous green and the largest ones quite approach *P. grandis* Copel..

2. **Plagiogyria maxima** C. Chr. in Bull. Mus. Paris II. 6: 105. 1934; Ind. Fil. Suppl. III. 141. 1936; Tard, et C. Chr. in Fl. Gen. Indo-Chine 7: 73 1939. Pl. XXVIII, 1 & 2.

Yunnan: Ping Pien Hsien, Tawei-shan, south of the city, *R. C. Ching 22, 63*, July, 1952, under the primitive evergreen broad-leaved forest, 1200 m. alt; ibidem. *K. M. Feng 156*.

Tonkin: Chapa, on the Chinese border, *Colani* (type), Nov. 1924.

This most distinct species is the largest so far known of the group of *P. euphlebia* and of a far larger and more robust habit than *P. grandis* Copel., from which it is distinguished by the stipe thick as a finger and by numerous (20 pairs) large pinnae 20—30 cm long, 2 cm broad of much thicker texture having dentato-serrate margin throughout and by the shortly forked veins.

The Chinese specimens cited are exactly like the type from Chapa, Tonkin, on the border of S. E. Yunnan.

3. **Plagiogyria integripinna** Ching, sp. nov. Pl. XXIX, 1 & 2.

Planta maxima, parte inferiore stipitibus deest, verisimiliter 30—40 cm longo, usque ad 7 mm crasso, per totam altitudinem aerophoriis magnis alternatim praedito, lamina 90 cm vel ultra longa, 40 cm lata, ovato-oblonga, impari-pinnata; pinnis utraque latere 20—25-jugatis, alternantibus, patentibus, liberis, sessilibus, 4 cm inter se remotis, infimis paulo abbreviatis, medialibus ad 23 cm longis, 2 cm latis, lineari-lanceolatis, basi rotundo-cuneatis, apice longe acuminatis et in acumina lineari 2—5 cm longa productis marginibus integris, apicem versus paulo crenato-serratis, bas bus pinnarum subtus aerohoris magnis subtensis, pinnis supremis sensim abbreviatis, 10—13 cm longis, basi cuneatis, leviter et aequaliter adnatis, textura chartacea, virescenti; venis recte patentibus, furcatis, rarissime simplicibus, imprimis, subtus prominentibus. Fronde fertili steriles aequalonga, rhachi indumentum furfuraceum rufum dense obtecta, pinnis remotis, 20—23 cm longis, 2.5 mm latis, linearibus.

Yunnan: Ping Pien Hsien, Taweishan, *K. M. Feng 232*.

The species resembles *P. maxima* C. Chr. of the same region, differing in narrower pinnae with entire margin and much thinner texture.

4. **Plagiogyria attenuata** Ching, sp. nov. Pl. XXX, 1

Species gregis *P. euphlebiae* (Kze.) Mett., differt habitu gracilicre, parva, pinnis lateralibus paucioribus, anguste linearibus, usque ad 10 cm longis, 1 cm latis, basin versus gradatim attenuato-cuneatis.

Stipite folium sterilum 14 cm longo, tenui, lamina ca. 20 cm longa, 14 cm lata, impari-pinnata; pinnis lateralibus 7-jugis, cum terminale conformibus, oblique ascendentibus, ca. 10 cm longis, 1 cm medio latis, anguste lanceolatis, versus apicem et basin gradatim attenuatis, apice acuminatis, dentatis, basi anguste cuneatis, petiolatis, marginibus obscure undulato-denticulatis, textura coriacea,in sicco fusco-brunnea; venis patentibus, furcatis vel nonnullis simplicibus, utraque pagine prominulis. Stipite folium fertilum 30 cm longo, lamina 15—20 cm longa, pinnis ca. 2 mm latis, linearibus, soris confluentibus, cinnamomeis, foliorum superficies inferiores omnes tegentibus.

Kwangtung: Hwei-yang Hsien, Lim-Fung Shan, Lin Fung Monastery, *Tsang, W. T. 25526*, August 11—31. 1935, in thickets, abundant.

A rather small and elegant species, easily distinguished from *P. euphlebia* (Kze.) Mett. by much smaller dimension, with fewer narrowly lanceolate pinnae gradually attenuate towards cuneate base. The specimen from Kwangtung referred to the Philippine *P. Christii* by Copeland (l. c. 389) may belongs to our species or to *P. euphlebia* Mett.

5. **Plagiogyria chinensis** Ching, sp. nov. Pl. XXX, 2

Species gregis *P. euphlebiae* (Kze.) Mett., differt habitu minore, pinnis lateralibus multo brevioribus, inferioribus oblique ascendentibus, haud deflexis vel horizontaliter patentibus.

Rhizomate crasso, brevi, erecto; frondibus fasciculatis, numerosis, stipite sterilis ad 25cm longo, tenui triquetro, supra sulcato, lamina 25—30cm longa, 10—12cm lata, impari-pinnata; pinnis lateralibus 10—12-jugis cum terminale conformibus, alternantibus, ca. 2cm a se remotis, basalibus medialibus aequilongis, 8cm longis, 1.4cm latis, lineari-lanceolatis, adscendentibus, apice acuminatis, basin versus rotundo-cuneatis, petiolulatis, marginibus fere integris vel saepe obscure serrulatis apice serrata exceptis, pinnis supremis brevioribus, sessilibus vel leviter adnatis sed haud secus rhachim recurrentibus, textura chartacea, in sicco flavo-viresecenti, glabra; venis patentibus, furcatis vel interdum simplicibus, utraque pagine prominentibus. Stipite fertilis 40—60cm longo, pinnis 5—10cm longis, ca. 3mm latis, linearibus.

Fukien: Dsung-an Hsien, Wu-i Shan, Sih-feng Ling, Science Institute of Fukien Province, specimens without number, August 16. 1952.

An interesting addition to the group of *P. euphlebia* Mett. from which this new species can be easily distinguished by smaller size, slender habit and the much shorter pinnae, of which the lowest ones all direct obliquely upwards. From *P. attenuata* Ching the present species differs in broader pinnae with round-cuneate base, rather short acuminate apex and thinner texture.

6. **Plagiogyria euphlebia** (Kze.) Mett. Farngatt. Plagiogyria 10. n. 6. 1858; Makino in Bot. Mag. Tokio **8**: 334. 1894; Diels in Engl. u. prantl, Nat. Pflanzenfam. **1**: iv. 282. 1899; Christ in Bull. Acad. Géogr. Mans. **11**: 232. 1902; Matsumura, Ind. Pl. Jap. **1**: 332. 1904; C. Chr. Ind. Fil. 495. 1905 (pro parte); Hayata, Ic. Pl. Form. **4**: 239. 1914; Hand-Mzt. Symb. Sin. **6**: 38. 1929; Ogata, Ic. Fil. Jap. **4**: t. 184. 1931; Devol, Ferns East. China 57. 1945. Pl. XXXI, 1.

Lomaria euphlebia Kze. in Bot. Zeit. **1848**: 521; Hook. Sp. Fil. *3*: 20. 1860; Hook. & Bak. Syn. Fil. 183. 1868 (pro parte).

Acrostichum triquetrum Wall. List n. 23. 1828 (nom. nud.)

Plagiogyria triqueta Mett. l. c. n. 5.

Stenochlaena triquetra J. Sm. in Hook. Journ. Bot. **4**: 149. 1841 (nom. nud.); Presl, Epim. Bot. 165. 1849.

Yunnan: Long-ly, *Maire 104* (1911); Chengtong Shan, *Delavay*; between Kambaiti & Tengyueh, *J. F. Rock 7572*.

Szechuan: Mt. Omei, foothill, *R. C. Ching*, under evergreen forest, 800m. alt. March. 1956, common; *W. P. Fang 12526*, July 26. 1938; *F. C. Peng 34*; Ma-pien Hsien, *T. T. Yü 4212*, Nov. 4. 1934 under wood; Yah-an Hsien, Mon-chen, *Chang Tang-hou 1176*, July 30. 1939; Chungking, peh-pei, Tsing Yin shan, *Liu Chen-Tsun 10037*, Sept, 3. 1957.

Kweichow: Yunfou Shan, Tuyun, *Y. Tsiang 5895* (ad *P. grandis* Cop.), *438*; *S. Y. Hou 1734*, Dec. 1. 1942; Kweiting, *Y. Tsiang 5500*; Pin-fa, *Cavalerie 347* (pro parte); Kweiyang, *Bodinier 2395*; *Handel-Mazzatti 10455*, 1100—1250m. alt.; Chen-i Hsien, Ching-tin Shan, Ecological section, Bot. Inst, Academia sinica No. *1254*, Aug. 30. 1956.

Kiangsi: Lu-shan, *Carles 255*, August 8. 1892; *C. Devol 1263* (ad *P. grandis* Cop.), common in southern slope of the mountain, under forest.

Fukien: Shaowu, Tung Che Loo, *Fang Hsioh Niao 9244*.

Kwangtung: Tai Tung, Lokchong, *N. C. Chun 42878*, Nov. 12. 1931; Hwei-yang Hsien, Ling Fung Shan, *Tsang, W. T. 25634*, August 11—31 1935, under scattered shrubs, common.

Chekiang: Ching Yuan Hsien, *R. C. Ching 2359*, August 8. 1924, 4000 ft. alt. under

shaded ravine.

Also Taiwan, Japan, Korea (Quelpaert, Tsu-sima) and Northern India.

Type of the species was collected in Japan by Göring.

A very distinct species characterized by rather ample impari-pinnate fronds with 7—17 pairs of linear-lanceolate pinnae, of which the terminal one is similar to the lateral ones, 10—15cm long, 1.2—1.5cm broad, margin entire or subentire below the sharply serrate apex and by being hardly narrowed towards round-cuneate base.

Specimens from West China and Northern India (Khasia) are on average larger than those from Japan and East China, which latter are dry brownish-green, not blackish or olivaceous-green as are the plants from West China and India. The lowest pinnae are more remote. It may be considered as **P. euphlebia** var. **triquetra** (Wall.) Ching.

Another species of the group is *P. integripinnata* R. Bonaparte from Singapore, characterized by entire pinnae below 3 cm long, 7 mm broad. The Philippine species, *P. Christii* Copel. (l. c. p. 388) of which I saw a number of specimens from Mt. Apa, the island of Mindanao appears not essentiatty different from *P. euphlebia*, except having more attenuate pinnae at base and the serrate margin from the base upwards. The specimens from Kwangtung, South China, referred to the Philippine species by Copeland (l. c.) is not specifically distinct from *P. euphlebia* Mett.

7. **Plagiogyria assurgens** Christ in Bull. Soc. Bot. Ital. **1901**: 293; C. Chr. Ind. Fil. 495. 1905; Copel. in Phil. Journ. Sci. **38**: 398. 1929; Ching, Ic. Fil. Sin. **4**: t. 155. 1937.

Lomaria deflexa Baker in Journ. Bot. 1888: 226 (non Col. 1844, nec Liehm. 1849).

Blechnum Faberi C. Chr. Ind. Fil. 495. 1905.

Szechuan: Mt. Omei, *E. Faber 1023* (type of *Lomaria deflexa* Baker); *W. P. Fang 975*; *E. H. Wilson 5284*; *H. C. Chow 12333*, July 24. 1940; O-pien Hsien, Sah-pien, *Yao Chung-wu 4546*, August 10. 1939; Tah-liang, Shan, *T. T. Yü 3603*, *4045*, Sept. 22. 1934, under wood; Tien-to Shan, *Scallan* (type).

Sikang: Tien-chien Hsien, Erh-long Shan, *H. L. Tsiang 34786*, 1920 m. alt. July 9. 1935; Yah-an Hsien, Chow-Kong Shan, *H. C. Chow 150*, July 14. 1939.

A very distinct local species endemic in the mountain forests in southwestern Szechuan. Quite variable as to size. Tsiang's *No. 34786* has the middle pinnae to 14cm long, 1.3cm broad, margin entire below the gross-serrate acuminate apex, while Yao Chung Wu's plant fron O-pien Hsien has the middle pinnae to 6 cm long, 6mm broad only, but both agree in essential characters. The under side of fronds snow white, but may sometimes be green during the young state, as is represented by *Lomaria deflexa* Baker from Mt. Omei.

The relation of the species to *P. distinctissima* Ching is evident especially when the leaves are devoid of white mealy powder beneath, from which it is distinguished, apart from white under surface, by the several pairs of lower pinnae being shortened and strongly deflexed, due to all the pinnae having more decidely recurrent upper side of the base and by the rachis being obscurely keeled beneath.

8. **Plagiogyria distinctissima** Ching in Bull. Fan Mem. Inst. **1**: 145. 1930. Pl. XXXI, 2

Plagiogyria adnata Bedd. Ferns Brit. Ind. t. 51. 1865; Handb. Ferns Brit. Ind. 127. 1883, quoad plantae indicae borealis; Christ in Bull. Acad. Géogr. Mans *1902*: 232; *1904*: 111; Hand-Mzt. Symb. Sin. **6**: 38. 1929.

Lomaria adnata Hook. Sp. Fil. **3**: 19 t. 147. 1860; Hook. & Bak. Syn. Fil. 182. 1874 (pro parte); Clarke, Ferns North. Ind. 472. 1880.

Plagiogyria adnata var. *condensata* Christ in Bull. Soc. Bot. France **52**: Mém. I. 64. 1905.

Plagiogyria adnata f. *reducta* C. Chr. Ind. Fil. Suppl. III. 140. 1936.

Szechuan: Mt. Omei, *W. P. Fang 3361* (type), August 26. 1928; *E. H. Wilson 2680*; *Brown 152* (1928); *T. Y. Chow 103* (1939); *F. C. Peng 330*, August 20. 1938, damp place, 760m. alt.; Tsing-in-ko, *Yao Chung-wu 4924*, August 30. 1939; ibidem, *W. P. Fang 3885*; Hung-ya Hsien, *W. P. Fang 8081*, August 10. 1930, 1700m. alt.; Nanchuan, Hsien, King Fu Shan, *W. P. Fang 5791a*; Lo-shan, *F. T. Wang 23631*, August 29. 1931, 808m. alt.

Sikang: *T. T. Yu 4191* (pro parte).

Kweichow: Tau Shan, *Cavalerie 28401, 2841, Bodinier 2540*; Houang-tsao-pa, *Cavalerie 7233*; Kweiting, Yunfou Shan, *Y. Tsiang 13435, 5553*, July 3, 19, 1939, 600m alt.; Tou-yun, *S. Y. Hou 1732*, Dec. 10. 1942, in acid soil, 1000m alt.; Tong-chow, *Esquirol 3248*; Kwei-yang, *Bodinier 2541*; Pin-fa, *Cavalerie 2*; *H. Handel-Mazzatti 10528*, 1100—1250m alt.; Chen-i Hsien, Ecological survey party, Bot. Inst. No. *1292*, Aug. 30. 1956. in dense forest.

Yunnan: Mengtze, *A. Henry 9036*; Pien-pie Hsien, Ta-wei Shan, *K. M. Feng 4797*, in dense forest in damp place, Oct. 9. 1954; Tchen Fang Shan, *Delavay 5118* (type of var. *condensata* Christ).

Kwangsi: Yuang Tung Shan, Shan Fang, on the border of Kweichow, *R. C. Ching 5737*.

Kwangtung: Swatow, Thai-yong, *Dr. Dalziel*, July. 1901.

Fukien: Lien-chen Hsien, *Y. Ling 3919*, Oct. 13. 1943, in bamboo thickets; *Chow* Nan-sun *486*.

Kiangsi: Lu-shan, *R. C. Ching*. Also Chakiang: Hangchow.

Also Japan, Northern India and Upper Burma.

The nomenclatural confusion of the present species dates back to the time of Hooker and Beddome, who applied Blume's *Lomaria adnata* from Java to the northern Indian plant, which they thought identical with Blume's type. This mistake had since been perpetuated by subsequent authors on ferns in China and Japan. However, as early as 1880, C. B. Clarke (l. c) already pointed out that the Indian fern so called *Plagiogyria adnata* by Beddome is possibly not the same as Blume's *Lomaria adnata* from Java.

This is one of the most common ferns of the genus in the mountain forests in Central and Western China, and westwardly to Upper Burm and the Eastern Himalayas and eastwardly to Japan. It differs from typical *P. adnata* from the tropics in much smaller and narrower fronds, the decidedly falcate and closer pinnae, of which the lower ones are more or less deflexed, with the lower side of the base cuneate and free, while the upper side always runs upwards along the rachis halfway up, or often nearly to the lower side of the upper next pair of pinnae.

The species often grows side by side with *P. japonica* Nakai in nature, for example, *W. P. Fang's No. 5791* from Nanchuan Hsien represents the two species.

The type of the species was based upon a specimen from Mt. Omei, Szechuan, which however represents a reduced form of otherwise a very common fern in the mountain.

9. **Plagiogyria yunnanensis** Ching in Bull. Fan Mem. Inst. 2: 186 pl. 1. 1931; C. Chr. Ind. Fil. Suppl. III 141. 1936; Tard. et C Chr. in Fl. Gen. Indo-Chine 7: 75. 1939.

Yunnan: Mengtze, *W. Hancock 216* (type); Mar-li-po. Sze-tai po (Lao-ching-shan), *K. M. Feng 13756*, Dec. 10. 1947, in mixed forest, 1600—1800m. alt., common.

Tonkin: Chapa, *Petelot*; Mont. Bavi, *Petelot*.

The most distinct and also the smallest species ever known of the genus in China. It belongs to the group of *P. adnata* (Bl.) with short, broadly lanceolate, obtuse or at most acute pinnae having crenato-serrate margin and simple veins.

10. **Plagiogyria liankwangensis** Ching, sp. nov. Pl. XXXII, 1

Plagiogyria adnata Wu, Wong et Pong in Bull. Dept. Biol. Sunyat-shan Univ.

No. 3. 220 pl. 101. 1932 (non Bedd.).

Plagiogyria intermedia C. Chr. in Bull. Dept. Biol. Sunyatshan Univ. No. 6: 13. 1933 (non Copel.).

Species configuratione medium tenet inter *P. japonicam* Nakai et *P. distinctissimam* Ching, a priore differt apice frondis coadnata, pinnis alternis, lanceolatis, rectis, basi aequaliter cuneato-rotundatis, textura tenuiora; a posteriore pinnis lateralibus fere liberis, basi superne nec secus rhachidem recurrentibus, infimis nec deflexis sed horizontaliter patentibus, textura tenuiora.

Ab speciebus duobus stipite fertilis a basi sursum distincter carinato diversa.

Stipe of the sterile fronds 20 cm long, sharply triangular, lamina 35 cm long, pinnate under the pinnatifid apex, pinnae about 15-jugate, alternate, 2 cm apart, sessile, lanceolate, hardly subfalcate, the basal ones nearly as long as those next above, 7—9 cm long, 1.2 cm broad, acuminate and serrate at apex, base cuneato-rounded, equal at both sides, the uppermost ones adnate but not recurrent at the anterior side, margin undulato-dentate, texture herbaceous, dry green, veins mostly forked. Fertile frond on stipe 30-40 cm long, lamina 15-25cm long, pinnae petiolate, 5-8 cm long, 2 mm broad.

Kwangsi: Ping Nam, Yao Shan, *C. Wang 39304* (type), June 8. 1936, ibidem, *K. K. Wang 185*; May 28. 1928; *Wang Yi-gi 5343*.

Kwangtung: In-tak Hsien, Tsing-shui Shan, *Hsu Hao Hsiung 150, 7182* (1956).

A critical species with a stronger approach to *P. japonica* Nakai, from which our species differs in much thinner texture of dry green leaves, the lanceolate pinnae with regularly dentate margin, in the free sessile lower pinnae with equally cuneato-rounded base and in the coadnate apical part of the frond as in *P. distinctissima*.

A quite common fern in the region, especially in Yao Shan, eastern Kwangsi.

11. **Plagiogyria hainanensis** Ching, sp. nov. Pl. XXXII, 2.

Species gregis *P. adnatae* (Bl.) differt majore, pinnis numerosis, breviter acuminatis vel acutis, inferioribus liberis, textura dure coriacea.

Stipite 30-35 cm longo, rufo-stramineo, glabro, basi dilatato, externe latere aerophoris parvis ornato, lamina 30-40 cm longa, 14 cm lata, apice pinnatifida; pinnis utraque latere 25-30-jugis, horizontaliter patentibus, lanceolatis, proximis, 7 cm longis, ad 1 cm latis, apice breviter acuminatis vel acutis, inferioribus ca. 10-jugatis liberis, petiolulatis, basi late cuneatis, superioribus basi inferiore latere liberis, superiore paulo adnatis, supremis basi utraque aequaliter adnatis; venis furcatis, superne occultis, inferne paulo prominulis, textura coriacea, siccitate brunneo-viridi, faciebus utraque glabra. Frondis fertilis ignotis.

Hainan: *C. Wang 35550*, Dec. 18, 1933.

A very distinct species by its numerous narrow lanceolate pinnae, of which the lower 10 pairs are free and petiolulate, by the very thick, rigid leaf texture, so thick that the veins are hidden above and only visible but not raised beneath as in the other related species.

12. **Plagiogyria japonica** Nakai in Bot. Mag. Tokio **42**: 206. 1928; C. Chr. Ind. Fil. Suppl. III. 141. 1936; DeVol, Ferns East. China 56. 1945. Pl. XXXIII, 1

Plagiogyria adnata (non Bedd.) Luers. in Engl. Jahrb. **4**: 356. 1883; Makino in Bot. Mag. Tokio **8**: 333. 1894; Matsumura, Ind. Pl. Jap. **1**: 331. 1904; Ogata, Ic. Fil. Jap. **4**: t. 183. 1934.

Plagiogyria intermedia Copel. in Phil. Journ. Sci. **38**: 390 t. 2. 1929.

Lomaria euphlebia Hook. Sec. Cent. Ferns t. 89. 1861 (non Mett.)

Plagiogyria adnata var. *distans* Rosenst. in Fedde, Repert. Sp. Nov. **13**: 122. 1913.

Szechuan: Mt. Omei, one specimen No. P34 in Herb. Bot. Inst. Academia Sinica;

Nanchuan Hsien, *W. P. Fang 5791b*, Nov. 8. 1922.

Kweichow: Van-ching Shan, Ma Chao Mo, *A. N. Steward, C. Y. Chiao* & *M. C. Cheo 439, 754*, Oct. 25. 1931, along moist shaded rocky slope, 1100 m. alt.; ibidem, *S. Y. Hou 898*; *Y. Tsiang 2551, 7703*, Dec. 18. 1930; Kweiyang, *Bodinier 2540*; Pin-fa, *Cavalerie 2* (pro parte), Tsing Chen, Ecological Survey Party Bot. Inst. Academia Sinica. *No. 1803*, 1400 m alt. Oct. 12. 1956, under broken forests on the slope.

Hunan: Han Shan, one specimen collected by the Dept. Biol. Nan-kai Univ., August, 1953.

Kwangsi: Lu-chen Hsien, Chu Feng Shan, 30 li s. of Shan Fang, *R. C. Ching 5898*, June 9. 1928.

Kwangtung: Yang Shan, *S. P. Ko 51021*, under wood, Dec. 3. 1930; *L. Tang 247*, August 2. 1936; Loh Fau Shan, *F. A. McClure 6861*, August 30 to Sept. 1921.

Anwhei: Chiu Hwa Shan, *R. C. Ching 8480*, Hwang Shan, Soong-kou-an, East China Bot. Station *No. 6486*; *M. Chen 1146*, Sept. 29. 1933; ibidem, *T. N. Liou* & *P. C. Tsoong 2961* in wooded ravine, Nov. 2. 1951; from Yun Kusze to Shihszeling, *T. N. Liou* & *P. C. Tsoong 2565*, August 12. 1935. A very common fern in Hwang Shan.

Fukien: Nan-ping Hsien, Loo-di, *Y. Ling*; Hsih-Yar Ling on the border of Chekiang, *Chu Pei-shih 34*.

Chekiang: Soong Yang Hsien, *K. K. Tsoong 719* (1929); on the border of Fukien, *R. C. Ching 2280* (1924); Tien Tai Shan *C. Y. Chiao 14513*; Ching Yuan Hsien, *R. C. Ching 2359* (1924).

Korea: Quelpaert, *Taquet 3809, 4489*; *Faurie 3809*, July 8. 1910; Tsu-sima, *No. 874* ex Herb. Hook. **Japan:** *Faurie 7787*; *W. Hancock 4*; *C. G. Matthew*; *Oldham*.

Also Taiwan and Assam (*G. A. Gamble 346*).

A distinct species widely distributed in Central and Southeast China, eastwardly to Taiwan, Japan and Korea. It can be easily distinguished from *P. distinctissima* (*P. adnata* Auctt.) by many pairs of lower pinnae being free, with equally cuneate base and separated by wingless rachis from each other and by the terminal coadnate pinna usually as long as the lower lateral ones. The basal pair of pinnae lanceolate, horizontally patent, rarely somewhat deflexed. From *P. euphlebia* to which this species was often referred by earlier botanists on Japanese ferns including Hooker & Baker, differs in the closer pinnae, the confluence of the upper pinnae and the sessile lower pinnae.

In general habit the species is exactly intermediate between *P. euphlebia* and *P. distinctissima* and may be a cross between the two, to which both it had been referred by authors before Nakai recognized it as a distinct species.

13. **Plagiogyria caudifolia** Ching, sp. nov.

Species inter *P. japonicam* Nakai et *P. liankwangensi* Ching, a priori pinnis lateralibus recto-lanceolatis, haud subfalcatis, apice breviter acuminatis vel subacutis, nec acuminatis, marginibus supra basin nec integris sed crenato-serratis; a posteriori pinnis lanceolatis versus apicem breviter acuminatis rectis nec antrorsim curvatis, marginibus regulariter acute serratis, apice frondis pinna quam pinnis lateralibus inferioribus etiam multo majore diversa.

Rhizome short, erect; *fronds* caespitose, stipe of the *sterile* frond 17-20 cm long, about 2 mm thick, teret below and grooved above, pale green above the dark straminous broadened base provided with one or 2 obselete aerophores or often no aerophores, lamina 32 cm long, 13-14 cm broad, oblong-lanceolate, base not narrowed, apex provided with one adnate lanceolate end-pinna even larger than all those down below, simple pinnate; *pinnae* 14 pairs (in the specimen examined), 7-7.5 cm long, about 9mm broad at the middle, separated by sinuses as broad as pinnae, lanceolate, somewhat narrowed

toward the more or less adnate base, apex short-acuminate or subacute, straight, margin sharply serrate above the crenato-serrate base, which is equally adnate to the rachis, the basal pinnae as long as those above with considerably narrowed base, which is free and cuneate below and slightly adnate above; *veins* subpatent, mostly forked above the base, distinctly raised oa both sides, one to each deltoid cuspidate tooth; *texture* chartaceous, dry green on both sides. *Fertile* frond much longer than the sterile, stipe to 50 cm long, dark-colored, firm, lamina 30 cm long, pinnae to 10 cm long, 3mm broad, 2 mm apart, oblique, petiolate, apex blunt, under side completely covered with cinnamon-brown sporangia.

Szechuan: Chungking, Peh-pei, Tsing Yin Shan, *Liu Chen-tsun of the South-western Teachers' College No. 10035*, Sept. 1957, under moist broad-leaved forest.

A critical species sharing the general habit of both *P. japonica* Nakai and *P. liankwangensis* Ching, with the former our new species agrees in having a terminal pinna even much longer than the lower lateral ones, but it differs in the lanceolate pinnae with straight and short-acuminate or subacute apex (not flacate acuminate apex as in *P. japonica*) with crenato-serrate margin from the base upward and more sharp serrature further up. From *P. liankwangensis* Ching our new species differs in the lanceolate pinnae with straight and short-acuminate or subacute apex, the more prominently and sharply serrate margin, the cuneate base more broadly adnate to the rachis and in the long end-pinna which is even longer than the lower middle ones.

14. **Plagiogyria subadnata** Ching, sp. nov.

Species gregis *P. adnatae* (Bl.) differt multo minore, lamina sterili 13-20 cm longa, 8-10 cm lata, pinnis utraque latere 13-19-jugis, 4.5-6.5 cm longis, vix ad 1 cm latis, falcatis, proximis, horizontaliter patentibus, apice breviter acuminatis, basi postice contractis, antice ad rhachin breviter recurrentibus, marginibus e basi sursum grosso-serratis, textura dure chartacea, siccitate opaque viridi; venis furcatis, rariter simplicibus, prominentibus. Stipite fertilis steriles superans, lamina 7-20 cm longa, 5-6 cm lata, pinnis 1.5 mm latis, a se valde remotis.

Kwangtung: Lung Tau Shan, Lu village, *To & Tsang 12099, 12320* (type), May 25, June 5. 1934, by the side of ravine.

Kwangsi: Ping Nam Hsien, Yao Shan, *C. Wang 40043*, Oct. 12. 1935, on wooded rock hill.

From *P. liankwangensis* Ching, our new species differs in smaller size, adnate lower pinnae of a falcate shape with coarsely serrate margin.

C. Wang No. *40043* from Kwangsi is somewhat different from the type in thicker texture and less prominently serrate margin.

15. **Plagiogyria adnata** (Bl.) Bedd. Ferns Brit. Ind. 51. 1865 (excl. t. 51); Diels in Engl. u. Prantl, Nat. Pflanzenfam. 1: iv. 282. 1899; C. Chr. Ind. Fil. 495, 1905 (pro parte); Posthumus, Varenflora voor Java 31. 1939; Holttum, Fl. Mal. II. Ferns 111. 1954.

Lomaria adnata Bl. Enum. Pl. Jav. Fil. 205. 1828; Hook. Sp. Fil. 3: 19. 1860 (excl. t. 147); Hook. et Bak. Syn. Fil. 182. 1874; Baker in Journ. Bot. 23: 103. 1885 (pro parte).

Plagiogyria rankanensis Hayata, Ic. Pl. Form. 8: 151 fig. 80. 1919.

Hainan: Five Finger Mt., *Eryl Smith 1451*.

Fukien: Chiang-han Hsien, *Y. Ling*, Oct. 22. 1943.

Szechuan: Chungking, Peh-pei, Tsing-yin Shan, Ecological section 557, June 7. 1956; *Liu Chen-tsun 10036*, Sept. 1. 1957.

Taiwan: Rankansan, *B. Hayata* (type of *P. Rankanensis* Hay.), 1400 m. alt.

Indo-Chine: Sud-Annam, *F. Flemy 38799* (1918); Mt. Bain, *Clemens* 4322.

Also Malaysia, Polynesia and the Philippine Islands.

Stipe 13-17 cm long, sterile lamina 30-38 cm long, 18-24 cm broad, pinnae 20 or more pairs, lanceolate, acuminate, not falcate, 12-14 cm. long, 1-1.2 cm. broad, basal ones longer than, or as long as those next above, more or less deflexed, sessile, base cuneate, equal, the upper ones adnate, but not recurrent at the upper side of base along the rachis as in *P. distinctissima* Ching.

The Taiwanese *P. rankanensis* Hayata proves quite typical of the Javanese type according to the figure and description given by the author.

The report of this species from the mainland of China and Northern India by authors in the past was a mistake for what I called *P. distinctissima*, as examplified by Beddome's figure in his Ferns of British India.

16. **Plagiogyria decrescens** Ching, sp. nov. Pl. XXXIII, 2.

Stipite frondis sterilis 10—15 cm longo, fulvo purpuraceo, rhachique marginato, lamina 30-45 cm longa, 10-15 cm medio lata, lanceolata, deorsum gradatim angustata, pinnata cum apice coadnato-pinnatifida; pinnis utraque latere 30—50-jugatis, infimis valde abreviatis, deltoideo-auriculiformibus, vix 1.2 cm longis, deflexis, sequentibus gradatim longioribus, medialibus 6 cm longis, 8 mm basi latis, rectis, e basi latissima lanceolatis, sessilibus, apicem versus attenuato-acuminatis, basi utraque latere truncatis, inferne tuberculum unum praeditis, marginibus acute serratis, textura chartacea, in sicco flavo-brunnea, glabra; venis creberrimis, subrecte patentibus, furcatis aut simplicibus, prominulis. Frondis fertilis stipite longioro, pinnis ca 30-jugis, 6-8 cm longis, ca. 1.5 cm a se remote separatis, fere sessilibus.

N. W. **Yunnan:** Taron-taru Divide, Valley of Bucahasang, *T. T. Yü 20070*, under woods, 2600 m. alt., Sept. 3. 1938.

One of the smallest and very distinct species of the group of *P. pycnophylla*, differs in dark purplish-brown and distinctly marginate stipe and rachis, the gradually shortened lower pinnae with the lowest ones reduced into deltoid auricles about 1.2 cm. long.

17. **Plagiogyria taliensis** Ching, sp. nov. XXXIV, 1.

Caudice crasso, erecto, cylindrico, reliquis basibus stipitum dense obtecto, stipite frondis sterilis ad 20 cm longo, brunneo-stramineo, triangulare, marginato, lamina 40 cm longa, 14 cm lata, elongato-oblonga, apice pinnatifido-coadnatis; pinnis 20-25-jugis, proximatis, spatio ca. 5 mm lato a se separatis, infimis 7 cm longis, sequentibus 8-10 cm longis, alternis, lineari-lanceolatis, acuminatis, basi cuneatis, petiolulatis, supremis paulo adnatis, marginibus subintegris vel ad apicem obscure serrulatis, textura coriacea, glabra, facie superiore viridi, inferiore paliore, ad basibus pinnarum aerophoriis parvis ornatis; venis subrecte patentibus, plerisque simplicibus, utraque prominentibus. Frondis fertilis stipite sterilis longioro, pinnis ad 10 cm longis, 3 mm latis, petiolulatis, apice obtusis.

W. **Yunnan:** Tali range, near Tsoong-ho-tze, *Y. Tsiang 11604*, 2500 m alt. in shaded ravine; ibid., Fung-yi Tung, *Liou Tchen-Ngo 23005*, Nov. 25. 1946.

A distinct species of the group of *P. pycnophylla* Mett. differs in much smaller size with narrowly linear-lanceolate subentire pinnae of coriaceous texture with cuneate base.

18. **Plagiogyria simulans** Ching, sp. nov. Xl. XXXIV, 2.

Stipite ad 26 cm longo, pars inferiore nigricans, sursum stramineo, rigido, lamina 35 cm longa, 16 cm medio lata, elongato-oblonga, apice breviter acuminata et pinnati-

fida; pinnis utraque latere ca. 17-jugis, petiolulatis, patentibus, spatio latitudine pinnarum separatis, infimis 7.5 cm longis, lanceolatis, medialibus 8-9 cm longis, 1-1.2 cm latis et falcatis, apice obtusiusculo-acuminatis et grosse serratis, basi subrotundatis, marginibus regulariter argute dentatis, ad basibus pinnarum aerophoris magnis elongatis ornatis, textura chartacea, facie superiore viridi, inferiore coerulescenti-viridi; venis patentibus, furcatis aut simplicibus, in dentibus intrantibus. Frondis fertilis stipite steriles aequalongo, lamina quam sterilis breviore (7—8 cm longa), pinnis ca. 9 cm longis, 3 mm latis, petiolulatis, apice apiculatis.

N. W. **Yunnan:** Without locality, *M. K. Li 1052* (type).

In habit and color of fronds the species resembles *P. taliensis* Ching, differs in sharply dentate margin of the falcate pinnae with rather bluntish acuminate and gross-serrate apex, from *P. virescens* Ching, our species differs in smaller falcate pinnae and bluntish (not long-acuminate) gross-serrate apex.

19. **Plagiogyria lanuginosa** Ching, sp. nov. Pl. XXXV, 1.

Caudice deest. Stipite 50 cm longo, usque ad 7 mm crasso, stramineo, rhachique densissime furfuraceo-tomentoso, basi latere exteriore aerophoris fere carentibus vel paucibus, lamina ampla, ad 70 cm longa, 28 cm lata, oblongo-ovata, deorsum paulo angustata, apice coadnato-pinnata; pinnis lateralibus ca. 35-jugis, proximis, spatio latitudine pinnarum separatis, medialibus ad 17 cm longis, 1.5 cm vel ultra latis, subfalcatim lanceolatis, basi postice rotundatis, antice oblique truncatis, sessilibus, apicem versus longe acuminatis, acumina 1.5 cm longa, serrata praeditis, marginibus creberrime dentato-serratis, dentibus deltoideis, minutis, apice arcuato-curvatis; textura chartacea, colore fulvo-viridi, glabra; venis subrecte patentibus, utraque faciebus distinctis, aut simplicibus aut furcatis, in dentibus intrantibus. Stipite frondis fertilis ad 60 cm longo, rhachideque iisdem indumentum ac in stipite rhachique sterilis densissime furfuraceo, lamina 40 cm longa, 20 cm lata, pinnis numerosis, linearibus, 12 cm longis, 2.5 mm latis, pedicellulatis, apiculatis, soris ochraceis.

Yunnan: Mar-li-po, Chung Daai, on the border of Tonkin, *K. M. Feng 12788*, in mixed forest, 1600-1800 m. alt., common.

A distinct member of the group of *P. pycnophylla* Mett. from which it can be easily distinguished by the enonmous size, more widely separated pinnae, and the dense, woolly, gray-brown, persistent indumentum on stipe and rachis.

20. **Plagiogyria communis** Ching, sp. nov. Pl. XXXV, 2.

Lomaria pycnophylla (non Kze.) Hook. Sp. Fil. 3: t. 148, 1860; Hook. et Bak. Syn. Fil. 183. 1867 (pro parte); Clarke, Ferns North. India 172. 1880.

Plagiogyria pycnophylla (non Mett.) Bedd. Ferns Brit. Ind. t. 52. 1865; Handb. Ferns Brit. Ind. 129. 1883; Hand-Mzt. Symb. Sin. 6: 38. 1929; C. Chr. in Contr. U. S. Nat. Herb. 26: 360. 1931.

Caudice crasso, erecto, stipite ca. 30 cm longo, rufo-stramineo, per totam longitudinem aerophorifero, lamina ca. 60-70 cm longa, 20-24 cm lata, ovato-oblonga, apice pinnatifida, caudata; pinnis numerosis (ca. 25-40-jugis), proximis, ca. 10-12 cm longis, 1.2-1.7 cm latis, lanceolatis, sessilibus, patentibus, apicem versus sensim attenuato-caudatis (cauda 2-3 cm longa, lineari, serrata), basi latissima, utraque oblique truncata, inferne aerophora prominenti praeditis, textura herbacea vel tenuiter chartacea, siccitate opaque viridi, glabra, marginibus creberrime argute serrulatis; venis lateralibus patentibus, plerisque simplicibus rarius furcatis, proximis, utraque prominentibus. Stipite fertilis steriles superans, pinnis ca. 12 cm longis, 2 mm latis, apiculatis.

Yunnan: Kong-shan Hsien, Cham-mu-tong, *K. M. Feng 7407* (type), in wooded ravine, 1800-2000 m. alt., Sept. 4. 1940; *K. M. Feng 499*; Taron-Taru Divide, Tangtchwang,

T. T. Yü 19982 (pro parte) under mixed forest, 1800 m. alt., August 27. 1938; *Delavay 4411, 4412*; Salween, *G. Forrest 18842, 25379*, 9500 ft. alt.; Mengtze, *W. Hancock 107*; Botanical Station at Kunming *No. 289*.

Szechuan: Tahsingling, *Harry Smith 13528*, ca. 1600 m. alt. Oct. 19. 1934.

Also Northern India and Upper Burma.

This species has been what the early botanists on the Northern Indian and Chinese ferns called *P. pycnophylla*. However, an examination of the Javanese type of *P. pycnophylla* Mett. shows that the Yunnan-Himalayan *P. pycnophylla* of authors differs from the Javanese type as much as the Yunnan-Himalayan *P. glauca* differs from the Javanese *P. glauca*, although both species from the two regions are closely related, but the Javanese plant has much broader lamina consisting of larger and closer pinnae with coarse teeth towards apices.

21. **Plagiogyria virescens** (C. Chr.) Ching, sp. nov.

Plagiogyria glauca var. *virescens* C. Chr. in Contr. U. S. Nat. Herb. 26: 310. 1931.

Yunnan: Shweli River drainage, summit of Hsueh Shan Ting, east of Tengyuen, *J. F. Rock 7644*, Nov. 23. 1922.

Habit of *P. euphlebia* in lateral pinnae being wide apart from each other, the middle ones to 13 cm long, 1.6 cm broad with cuneato-oblique base, differs in pinnae with long-attenuate apices, in the pale green or even bluish-green under surface, in veins being mostly simple but much closer in the finely serrate margin and in the smaller adnate lateral pinnae towards apice. All of these characters combined indicate that the species develops in the direction of *P. pycnophylla*, from which our species differs in the pale green or bluish-green under surface, in the widely separated pinnae, in the smaller adnate apical pinnae similar to those underneath and in the free lateral pinnae with cuneate or cuneato-oblique base. From both species our new species further differs in the underside of costa of the pinnae being rather deeply longitudinally sulcate.

A critical species.

22. **Plagiogyria gigantea** Ching in Lingnan Sci. Journ. 15: 275. 1936; Tard. et C. Chr. in Fl. Gen. Indo-Chine 7: 75. 1939 (pro parte). Pl. XXXVI, 1.

Yunnan: Shweli-Salween Divide, *G. Forrest 25279* (type), Oct. 1924, plants 4-5 ft. tall; Yang-pie Hsien, Erh-ta-chai, west of Tali, *R. C. Ching 25299*, in thickets, Oct. 28. 1940.

S. W. **Szechuan:** *W. P. Fang 6830*, August 20. 1930.

Tonkin: Chapa, *Petelot 1968* (pro parte), Massif du Pia-ouac *Vieillard 662* (1932).

Like *P. communis* Ching in general habit, differs in being twice as large, the stipe from base upwards provided with large aerophores at regular intervals, pinnae numerous (about 45 pairs), 2 cm apart, sessile, the basal ones about 10 cm long, the middle ones 16-20 cm long, 1.5-2 cm broad, linear-lanceolate, long-acuminate, base oblique truncate, margin, regularly dentato-serrate from the base upwards, veins proximate, patent, mostly simple.

23. **Plagiogyria coerulescens** Ching, sp. nov. Pl. XXXVI, 2.

Planta robusta. Caudice erecto, crasso, stipite frondis sterilis ad 30 cm longo, valido, basi prominenter carinato, extus lateres aerophoris ca. 4-6 utrinque praedito, lamina 50 cm longa, 26 cm lata, apice pinnatifida; pinnis utraque latere ca. 35-40-jugis, proximatis, 2 cm a se remotis, suboppositis, sessilibus, inferioribus paulo abbreviatis, medialibus 17 cm longis, 1.5 cm latis, falcatim linearibus, basi utraque exiciso-truncatis, apice longe acuminatis, serratis, marginibus argute serratis; venis plerisque furcatis,

subrecte patentibus, utraque facie immersis vix notatis; costa pinnarum prominenti, subtus quadrangulari et in sicco medio late sulcata; rhachi pallide straminea, subtus applanata et ad basibus pinnarum tuberculis magnis nigris praedita; textura dure coriacea, subtus coeruleo-viridi. Fronde fertile deest.

Yunnan: Southwest. King Tung Hsien, Wuliang Shan, *W. H. Tsui 17* (1955), 3000 m. alt. under *Rhododendron* thickets near the mountain top.

A quite unique local species most nearly related to *P. virescens* (C. Chr.) Ching, especially in the point of bluish-green fronds underneath, but differs in the much longer pinnae with obliquely truncate base of rather rigidly coriaceous texture and in the veins not distinctly raised but only noticeable on both sides.

24. **Plagiogyria lineata** Ching, sp. nov. Pl. XXXVII, 1.

Stipite 50 cm longo, rufo-stramineo, lamina 100 cm longa, 25 cm lata, oblonga, apice coadnato-pinnatifida; pinnis liberis utraque latere ca. 50-jugis, 3 cm sese remotis, rectis, infimis paulo abbreviatis, sequentibus longioribus, 15 cm longis, 1.4 cm latis, anguste linearibus, apicem versus sensim acuminato-caudatis, basi rotundatis, subtus 1-glandulis, marginibus argute serratis, textura herbacea, siccitate atro-viridi; venis plerisque simplicibus, nonnullis furcatis, patentibus, utraque prominulis. Stipite fertilis steriles superans, pinnis 13 cm longis, 3 mm latis, apice attenuatis.

N. W. **Yunnan:** Taron-Taru Divide, Tangtchwang, *T. T. Yü 19982* (type, pro parte), under mixed forest, August 27. 1938, 1800 m. alt.; *C. W. Wang 67017*.

A distinct species of the group of *P. pycnophylla*, differs in much taller habit with narrowly linear-lanceolate pinnae having rounded base, separated from each other by a space of its own width.

25. **Plagiogyria formosana** Nakai in Bot. Mag. Tokio 42: 205. 1928; C. Chr. Ind. Fil. Suppl. III. 141. 1936. Pl. XXXVII, 2

Plagiogyria glauca var. *philippinensis* (non Christ) Matsu. et Hayata in Journ. Coll. Sci. Tokio Univ. 22: 615. 1906; ibid 25: 244. 1908.

Taiwan: Tazan-nitak, *G. Nakahaga* (type); *S. Tanaka*; *Drs. F. & C. Baker 23*, Nov. 1914; Mt. Arisan, *Faurie 421*; *S. Sasaki*, Jan. 1933. *Hsu Yong-chen 17, 21*.

Endemic in the high mountains of Taiwan. The species differs from the malaysia-polynasian *P. glauca* Mett. in narrowly and subfalcately lanceolate pinnae and, as a rule, in the almost free large end-pinna similar to the lower ones and in the thicker coating of white farinose under surface.

A distinct local species with narrowly lanceolate pinnae to 13 cm long, usually 1 cm broad, acuminate apex and cuneate, petiolulate base, separated by spaces about 2cm broad; apical pinna large free or nearly so and similar to the lower lateral ones but smaller.

Also a very variable species as to the size of the frond, with the pinnae ranging from 2—15cm long, 7—15mm broad, but the under surface is invariably white farinose. A much reduced form is:

var. **angustata** Nakai, l. c.

Plagiogyria glauca var. *philippinensis* (non Christ) Makino et Nemoto Pl. Jap. 1641. 1925.

Pinnae 2—9cm long, 4—8mm broad. This is an extreme form from a drier situation. *Plagiogyria nana* Copel. (l. c.) from the Philippine islands belongs here too.

26. **Plagiogyria media** Ching, no. nov. Pl. XXXVIII, 1

Stipite 10—15cm longo, stramineo, obscure triangulare, lamina late lanceolata, 25—35cm longa, 8—10cm lata, apice coadnata; pinnis lateralibus 30—40-jugis, contiguies,

oblique patentibus, petiolulatis, infimis ad 2—3cm longis vel paulo longioribus, medialibus plerumque 5—6cm longis vel brevioribus, 8—10mm latis, lanceolatis, apice breviter acuminatis, basi late rotundatis, superne viridi, inferne claro coeruleo-niveis vel interdum coerulescenti; venis aut simplicibus aut furcatis, utraque prominentibus, marginibus breviter serratis, textura subcoriacea; stipite fertilis ad 30cm longo, lamina 15cm longa, 6cm lata, pinnis lateralibus 3—4cm longis, 3mm latis, petiolullatis, apice obtusis.

N. W. **Yunnan**: Taron-Taru Divide, Tareelaka, *T. T. Yü 20914* (type), under bamboo thickets, 3000m alt., common, Nov. 1 1938; Shun-ning, Snow Range, *T. T. Yü 18235*, under thickets 3000m alt., common, Nov. 22. 1938; Champutung, Soo-goo-la, *C. W. Wang 66702*, under forest, Sept. 1935. 3000m alt, *G. Forrest 8882* (1912); Tali, Yang-pie Hsien, King-nu-tang, *Wang Han-chen 1903*, April 14, 1942, Chong-shan, *Liou Tchen-Ngo 17543*, Dec. 2. 1940; *Liou Tcheng-Ngo 17550*.

S. W. Szechuan: Mar Pie Hsien, *W. P. Fang 6284*.

Upper **Burma**: Maikha-Salwin Divide, *G. Forrest 24909*.

Northern **India**: Khasia, *Hooker et Thomson*; Munipur, *Meebold*.

This species, common in the mountains of Northwestern Yunnan and Northern India, is characterized by small stature with lanceolate fronds consisting of numerous short lanceolate lateral pinnae with short acuminate apex and rather low serrature along the leaf margin. It was previously considered by the English botanists as *P. glauca*(Bl.) Mett., with which it has in common only the bluish-white underside of the lamina, but from which it differs in much smaller size, the distinctly petiolate and obliquely patent pinnae, of which the longest being below 5—6cm long, and in the much smaller low teeth along the margin of the pinnae under the similarly serrate short-acuminate, not long-acuminate, apex. This species is very near *P. glauca* var. *Philippinensis* Christ.

27. **Plagiogyria glaucescens** Ching, sp. nov. Pl. XXXVIII, 2

Lomaria glauca (non Blume) Hook. Sp. Fil. 3: 22. 1860; Hook. et Bak. Syn. Fil. 182. 1864; Clarke, Ferns N. Ind. 472. 1880.

Plagiogyria glauca (non Mett.) Bedd. Ferns Brit. Ind. t 90. 1865; Handb. Ferns Brit. Ind. 129 1883; C. Chr. Ind. Fil. 496. 1905; Cop. in Journ. Phil. Sci. *38*: 393. 1929; Hand-Mzt. Symb. Sin. 6: 38. 1929; C. Chr. in Contr. U. S. Nat. Herb. 26: 310. 1931 (pro parte).

Stipite 20—30cm longo, crasso, duro, fusco-stramineo, e basi per totam longitudinem aerophoris prominentis praedito, lamina 50—60cm longa vel longiora, ca. 16 cm lata, oblonga, apice pinnatifido-caudata; pinnis utraque latere 46—50-jugis, contiguis, brevissime petiolulatis, oblique adscendentibus, infimis quam sequentibus brevioribus, medialibus 10—14cm longis, 1.3—1.6cm latis, lineari-lanceolatis, apicem versus sensim attenuatoacuminatis et serratis, prope basin undulatis, marginibus breviter serratis, textura crassiusculo-chartacea, facie superne viridi, inferne claro coerulea; venis aut simplicibus aut furcatis, patentibus, utraque prominulis. Stipite fertilis longioro, lamina 30—35cm longa, 10—15cm lata, pinnis 6—8cm longis, 3mm latis, petiolulatis, apice apiculatis.

N. W. **Yunnan**: Kong-shan Hsien, Mekong-Salwin Divide, Dongalumba, *K. M. Feng 7157* (type), under thickets in ravine, 2500—3100m. alt., August 30. 1940; Sila, *K. M. Feng 5568* in thickets, 2800—3000m. alt., July 18. 1940; *G. Forrest 28938* (1930—1931); Weisih Hsien, *K. M. Feng 4889* under thickets, 3000—3200m. alt., June 19. 1940; Yeh-chih, *C. W. Wang 63781*, *67014*, *67811*, *68658*, *68718*; *H. T. Tsai 59949*, in forest, 2800m. alt. Oct. 22. 1934; Likiang, Kesz, southern hills, *K. M. Feng 2621* in wooded ravine, 2600m. alt. Dec. 26. 1939.

S. E. **Tibet**: Tapu. Tung-chur-zoong, *Chia Shun-Sü 1978* (1952).

Also Northern India and Upper Burma, common.

This species, common in the mountains in Northwestern Yunnan from 2600—3200 m altitude, was previously considered as identical with the Javanese *P. glauca* Mett. from which it differs in the bluish-white underside of frond of larger size, the low serrature along the margin of the pinnae, which are obliquely ascending with long-attenuate apical part and in the rounded base and the thicker texture. As already observed by many botanists (Clarke l. c.; Copeland, l. c.), the Malayan *Plagiogyria glauca* (Bl.) Mett. shows no significant differences from *P. pycnophylla* (Kze.) Mett. except the glaucous back of the sterile pinnae, a character which is, however, shown to be very variable, for plants with bluish underside are not uncommon. In the case of our species, all the specimens cited above show constantly bluish-white under surface.

Var. **arguta** Ching, var. nov.

A typo recedite pinnis argute serratis, dentibus sat longis, arcuatis vel plus minusve incumbentibus instructis.

N. W. **Yunnan:** Liking, Kesz, *K. M. Feng 478* (type), March 10. 1939; Chien-su-I near the bank of King-sar-kiang, *K. M. Feng 3399*, 2500 m alt.; Weisih, Yeh-chih on the Mekong River, *K. M. Feng 4014*, under thickets in ravine, 2500-2900 m alt., May 20. 1940; Tali, Chong Shan, Zoog-ho Sze, *Tchen-Ngo Liou 21080, 21086*, in ravine, Oct. 4. 1946.

Differs from the type in longer sharp serrature which is more or less incumbent along the margin of the pinnae, otherwise similar to the type in all other respects.

28. **Plagiogyria Matsumuraeana** Makino in Bot. Mag. Tokio 8: 333. 1894; Matsumura, Ind. Pl. Jap. 1: 33. 1904; C. Chr. Ind. Fil. 496. 1905; Takeda in Bot. Mag. Tokio 24: 320. 1900; Nakai in Bot. Mag. Tokio 42: 192. 1928; Ogata, Ic. Fil. Jap. 4: t. 185. 1931.

Lomaria Matsumuraeana Makino in Bot. Mag. Tokio 8: 90. 1894.

Lomaria Fauriei Christ in Bull. Herb. Boiss. 4: 666. 1896.

Plagiogyria Fauriei Matsumura, Ind. Pl. Jap. 1: 332. 1904; C. Chr. Ind. Fil. 497. 1905.

Blechnum Fauriei Tokubuchi in Bot. Mag. Tokio 11: 231. 1906.

Lomaria euphlebia var. *serrata* Baker in Gard. Chron. new ser. 14: 494. 1880.

Japan: Endemic, ranging from Central Japan (Shinano, Mount Komagadana, as the type locality) northward as far as Hokaido.

Taiwan: According H. Ito (Illust. Pl. Form. f. 202. 1928.).

This is the only species of the genus growing in the temperate region, while all other species are mostly inhabiting mountain forests in subtropical and tropical countries at elevations from 700-3000 meters. This Japanse species has its close relatives both in China and Tropical Central America, namely, *P. argutissima* Christ in Kweichow Province and *P. semicordata* Presl with other related species in Central America, to which latter the affinity was noted as early as 1880, when Baker called the Japanese species *Lomaria euphlebia* var. *serrata* (cf. Gard. Chron. new ser, Vol. 14: p. 494.)

29. **Plagiogyria argutissima** Christ in Bull.Acad. Géogr. Mans 20: 141. 1910; C. Chr. Ind. Fil. Suppl. I. 55. 1912; Copel. in Journ. Phil. Sci. 38; 403. 1929. Pl.XXXIX, 1

Kweichow: River Taitchen in Pin-fa, *Cavalerie 3392*(type), Dec. 1908.

This seems to be a distinct but apparently a rare fern, so far yet little known among the ferns students. Although Copeland (l. c.) cited this as a valid species, he himself admitted he did not known it either. As pointed out by Christ (1. c.), the species is very near *P. semicordata* (Presl) of Andes in Central American. Among the Chinese species of the group it is very closely related to *P. stenoptera* (Hance), especially the form known as *P. Henryi* Christ in general habit, differs in the longer

stipe (7 cm), the gradually abbreviated, 4—5 pairs of lower pinnae in the form of deltoid, deflexed and lacerate or toothed small auricles (5—10 mm long), in the contiguous upper pinnae of a dry green and thin herbaceous texture, characterized by double-serrate margin below acuminate serrate apex. Christ also noted that in the fertile frond, the lower pinnae are long-stalked (1/2 cm) arising from a sterile, decurrent and adnate green auricle. This is in fact an abnormal state, also occasionally observed in *P. Henryi* and *P. Dunnii* Copel. In *P. Henryi* Christ, the lower 2-10 pinnae are always abruptly reduced into small roundish alternate auricles and in the entire pinnae below caudate serrate apex.

The relation of the species to the Japanese *P. Matsumuraeana* Makino is very evident by the general habit and often double-serrate margin, but differs chiefly in the rachis sharply carinate beneath, the lower pinnae gradually reduced into small lacerate auricles and in the rather long-stipitate fertile pinnae.

30. **Plagiogyria stenoptera** (Hance) Diels in Engl. u. Prantl, Nat. Pflanzenfam. 1: iv. 282. 1899; Christ in Bull. Acad. Géogr. Mans 11: 232. 1902; Matsumura, Ind. Pl. Jap. 1: 332. 1904; C. Chr. Ind. Fil. 496. 1905; Nakai in Bot. Mag. Tokio 42: 209. 1928; Copel. in Journ. Phil. Sci. 38: 398. 1929. Pl. XXXIX, 2

Blechnum stenopterum Hance in Journ. Bot. 1883: 268.

Lomaria stenoptera Baker in Journ. Bot. 1884: 142; Henry in Trans. Asiat. Soc. Jap. 24: Suppl. 101. 1896.

Lomaria concina Baker in Journ. Bot. 1885: 103; in Hook Ic. Pl. 17: t. 1644. 1886.

Plagiogyria Henryi Christ in Bull. Herb. Boiss. 7: 8. 1899; C. Chr. Ind. Fil. 496. 1905; Copel. Journ. Phil. Sci. 38: 399. t. 5. 1929; C. Chr. Contr. U. S. Nat. Herb. 26: 309 t. 21. 1931; Hu et Ching, Ic. Fil. Sin. 1: t. 30. 1930.

Lomaria decurrens Baker in Kew Bull. Misc. Inform. 1906: 9.

Plagiogyria Petelotii Copel. in Journ. Phil. Sci. 38: 399 t. 6. 1929.

Plagiogyria Matsumuraeana Hayata in Bot. Mag. Tokio 23: 32. 1909 (non Makino).

Yunnan: Kwang- nan, Hwa-gao-dar-ching, *C. W. Wang 87685*, March 10. 1940, 1500 m. alt; Wen-shan Hsien, Lao-jing Shan, *K. M. Feng 11102*, in mixed forest, 1800-2200 m. alt., August 12. 1947; Maa-luh-tang, *K. M. Feng 11258*, August 16. 1947; Mar-li-po, Chung Daai, *K. M. Feng 12880*, Nov. 4. 1947 in mixed forest, 1600-1800 m. alt.; Pieng Pien Hsien, Tawei Shan, *K. M. Feng 4606*, Sept. 21. 1954; Mengtze, *A. Henry 9036a* (type of *Lomaria decurrens* Baker), *13475*; between Kambaiti & Tengyueh, *J. F. Rock 7581*; East of Tengyueh, *J. F. Rock 7699*.

Kwangsi: Hsui-ren Hsien, Yao Shan, *C. Wang 40611*, Dec. 9, 1936, by the side of stream; *S. S. Sin 51120*.

Szechuan: Mt. Omei, *W. P. Fang 3177*, August 19, 1928 *S. C. Chen 30039*, *30132*, July 2. 1955; *S. C. Chen 10042*, August 16. 1933, 1750 m. alt.; Ma-pie Hsien, *T. T. Yü 4191*, Nov. 4. 1934, 950 m alt. under woods; Han-yuan Hsien, *W. P. Fang 3787*, Oct. 17. 1928, in thickets, 900-1000 m. alt.; Loo-shan Hsien, *F. T. Wang 23597a*, August 26. 1931, 1500 m. alt.; *Y. Chen*.

Taiwan: Tamsui, *W. Hancock* (type), Nov. 1881.

Also Indo-China, The Philippines and Liukiu (*Matsumura 222*).

A very distinct but also very variable species as to the length of the lateral pinnae, which vary from 3-5 cm long, but can always be easily distinguished by the herbaceous texture of leaves with sharply carinate stipe and rachis beneath, by the lower 2-10 pinnae rather suddenly reduced into roundish small alternate adnate auricles and by the beaked fertile pinnae.

Var. **major** Ching, var. nov.

Ab typo differt frondibus majoribus, ad 17 cm latis cum pinnis medialibus ad 9

cm longis, ceteris similis.

Kweichow: Chengfeng, Yang-kiawan, *Y. Tsiang 4653*, Oct. 13. 1931; *H. C. Cheo*, Sept. 11. 1931; *Loo Shih-wei*; Van Ching Shan, *A. N. Steward, Chiao & Chow 439a*, Sept. 11. 1931, under dense trees, 1300 m. alt.

Yunnan: Without locality, *E. E. Maire*.

The type of *P. stenoptera* (Hance) from Taiwan has fronds 6.5 cm broad at the middle, and the type of *P. Henryi* from Yunnan has fronds to 10 cm broad at the middle, while the present variety chiefly known from Kweichow Province has fronds to 17 cm broad at the middle, but besides the mere larger dimension of the leaves, the variety differs from the type in no other essential characters.

31. **Plagiogyria tenuifolia** Copel. in Phil. Journ. Sci. Sect. C. 281, 1908; Phil. Journ. Sci. **38**: 401. 1929; C. Chr. Ind. Fil. Suppl. I. 55. 1912.

Lomaria Matthewii Christ apud Dunn & Tutcher, Fl. Kwangtung & Hongkong 341. 1914.

Kwangtung: Ma On Shan, opposite Hongkong, *C. G. Matthew 51* (type), 450 m. alt. Feb. 3. 1907, in shaded crevices among rocks; *L. Gibbs 2* (1927).

Formosa: Hozan, *B. Hayata*; Arisan, *B. Hayata*, common.

A critical species of the group of *P. Dunnii* Copel. characterized by broadly ovate or oblong-ovate lamina with the lower 1-3 pairs of pinnae shortened a little bit and deflexed, and by the entire or coarsely serrate pinnae under the serrate apex. Pinnae 4-4.5 cm long, 8mm broad, acute, the lowest slightly shortened, the basal pair strongly deflexed. The species differs from *P. Dunnii* Copel. chiefly in the much shorter and ovate-oblong lamina consisting of only about 15 pairs of pinnae. It may prove to be a form of *P. Dunnii* Copel.

32. **Plagiogyria angustipinna** Ching, sp. nov. Pl. XL, 1.

Plagiogyria adnata Merr. Enum. Hainan Pl. in Lingnan Sci. Journ **1**: 15. 1927 (non Bedd.).

Species gregis *P. tenuifoliae* Copel. differt pinnis frondis sterilis valde angustioribus, medialibus 4cm longis, vix 5mm latis, marginibus a basi sursum regulariter obtuse serratis, venis semper a basi (haud medio) prope costam pinnulium furcatis.

Stipite 13—15cm longo, acute trigono, herbaceo, lamina longiora ad rhachidem pinnata; pinnis utrinque latere ultra 30, inferioribus paulo reductis, infimis valde deflexis, medialibus 4cm longis, vix 5mm latis, linearibus, breviter acuminatis, horizontaliter patentibus, sinubus latitudine pinnas vix superantibus separatis, marginibus a basi sursum regulariter obtuse serratis; venis plerumque furcatis, et semper a basi prope costam pinnulium furcatis.

Hainan: *C. Wang 35570* (type), Dec. 1828, in shade; Five Finder Mt., *F. A. McClure 9385* in forests at the summit of the mountain, June 17. 1924.

From both *P. tenuifolia* Copel. and *P. Dunnii* Copel. our new species differs in the very narrow pinnae with regularly serrate margin and in the veins forking low from the base near the costa of pinnae, while the veins in the other related species are always forking from high above the base.

33. **Plagiogyria Dunnii** Copel. in Phil. Journ. Sci. Sect. C. 281. 1908; C. Chr. Ind. Fil. Suppl. I. 55. 1912; Copel. in Journ. Phil. Sci. **38**: 402. 1929; C. Chr. in Bull. Dept. Biol. Sunyatshan Univ. No. 6. 13. 1933. Pl. XL, 2.

Plagiogyria Hayatana Makino in Bot. Mag. Tokio **23**: 245. 1909; Copel. in Phil. Journ. Sci. **38**: 401. 1929.

Plagiogyria Matsumuraeana (non Makino) Wu, Wong et Pong in Bull. Dept.

Sunyatshan Univ. No. 3. t. 102. 1932.

Plagiogyria adnata var. *angustata* Rosenst. in Fedde, Repert. Sp. Nov. 13: 122. 1914.

Plagiogyria falcata Nakai in Bot. Mag. Tokio 42: 208. 1928; Ito. Ic. Pl. Form. Pl. 201. 1928 (non Copel.).

Kwangtung: Tsungfa-Lungmoon Districts, Sam Kok Shan, *Tsang, W. T. 20364, 20438.*

Fukien: Mountains near Yenping, *T. S. Dunn 3934* (type), 900m. alt.; Hsih Yar Ling, on the border of Chekiang *Chu Pei Shi 32.*

Chekiang: Ningpoo, Tien-tung, *K. K. Tsoong 392* (1927).

Anhwei: Southern part, Chemen, *R. C. Ching 8787* (typical).

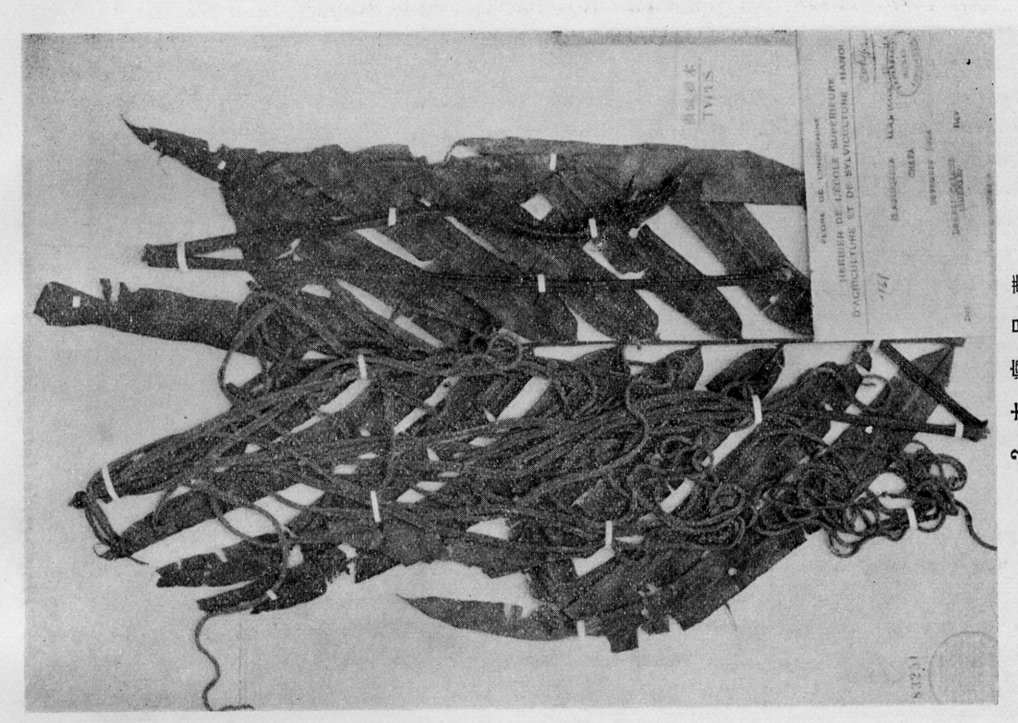
Kweichow: Pin-fa, *Cavalerie 3392*, Oct. 1912; Tongchow, *Esquirol 3247.*

Kwangsi: Ping Nam Hsien, Yao Shan, *K. K. Wang 184*, May 28. 1928, in Bamboo thickets, 80 m alt.

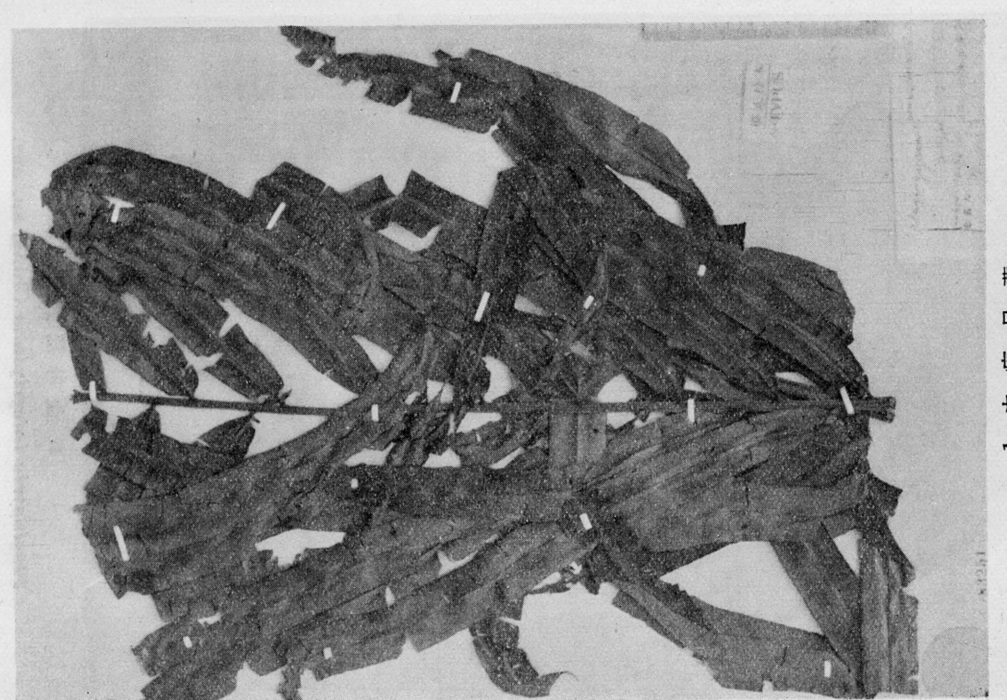
Formosa: North of Arisan, *W. R. Price* (1912), 7000 ft. alt.

A very distinct species of the group of *P. stenoptera* (Hance) from the mountain forest in South China and also in the Island of Taiwan, where the species was taken by Japanese botanists for *P. falcata* Copel., a distinct Philippinese species, while R. C. Ching No. 8787 from Southern Anwhei was doubtfully referred by Copeland (l. c.) to *P. Hayatana* Makino from Taiwan, which is identical with *P. Dunnii* Copel.

The present species is very much near to the variable *P. stenoptera* (Hance) Diels first described by Hance from the Island Taiwan, to which *P. Henryi* from Chinese mainland is reduced as a synonym, and from which the species is distinguished chiefly by the lowest pinnae not abruptly deformed into roundish small auricles, but remain practically the same form as those above, although they are generally more or less deflexed, and by the mature fertile pinnae not beaked but blunt at apex. The figure given by Wu, Wong and Pong under *P. Matsumuraeana* is typical of our species, now a common fern in Southeast China.



2. 大瘤足蕨 *Plagiogyria maxima* C. Chr.



1. 大瘤足蕨 *Plagiogyria maxima* C. Chr.

2. 全叶瘤足蕨
Plagiogyria integripinna **Ching, sp. nov.**

1. 全叶瘤足蕨
Plagiogyria integripinna **Ching, sp. nov.**

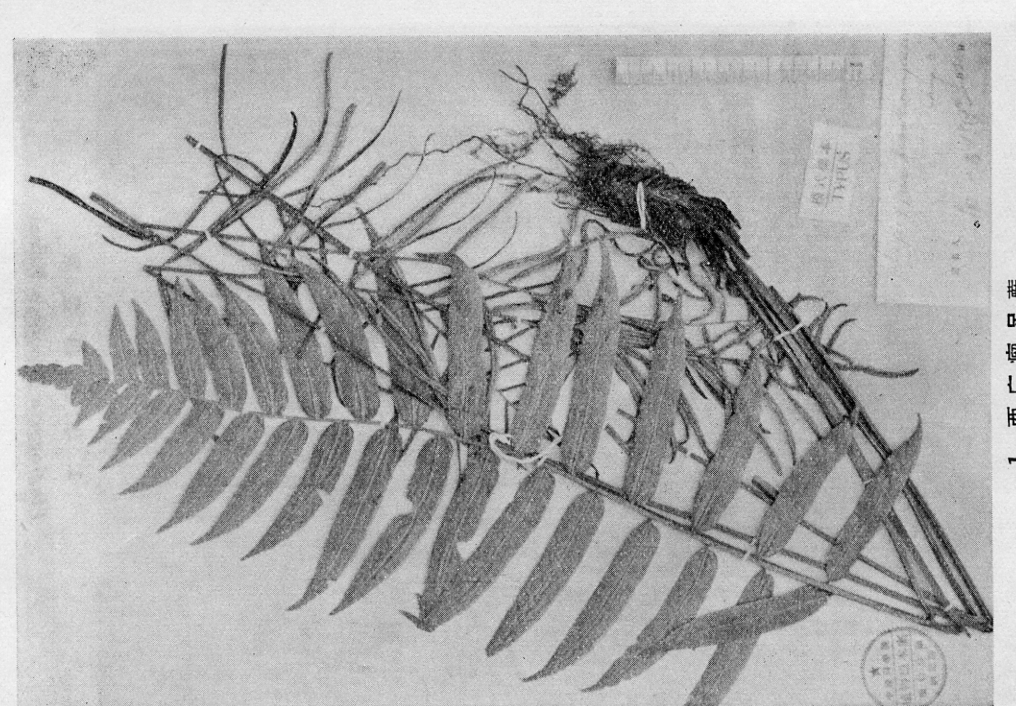
2. 武夷瘤足蕨 *Plagiogyria chinensis* Ching, **sp. nov.**

1. 桃叶瘤足蕨 *Plagiogyria attenuata* Ching, **sp. nov.**

1. 华中瘤足蕨
Plagiogyria euphlebia (Kze.) Mett.

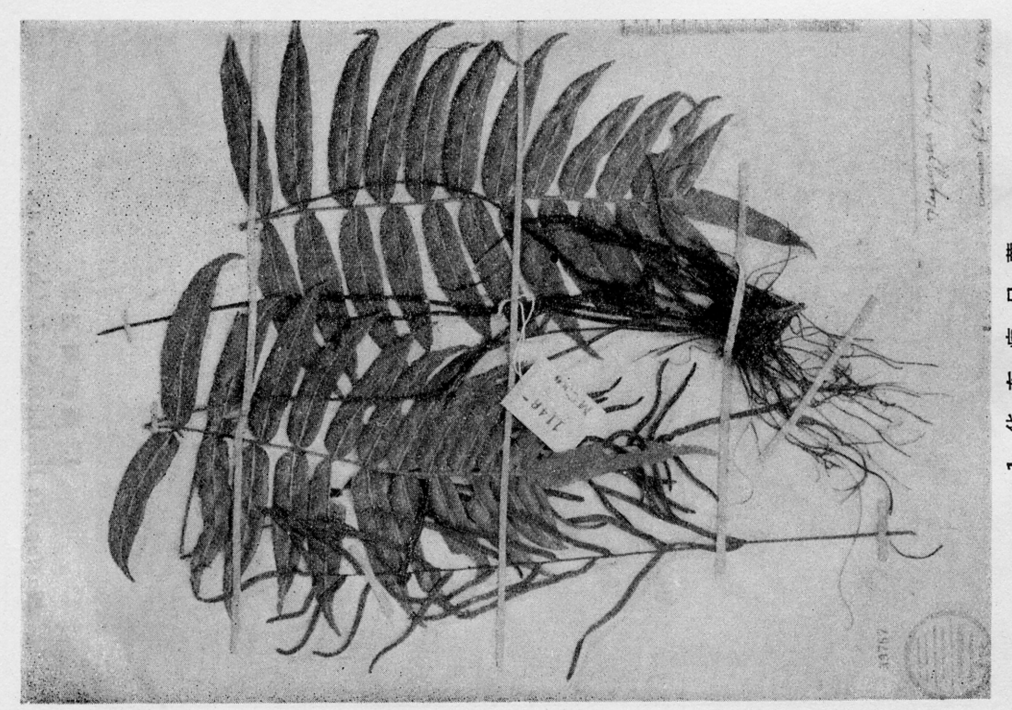
2. 镰形瘤足蕨
Plagiogyria distinctissima Ching

2. 海南瘤足蕨 ***Plagiogyria hainanensis* Ching, sp. nov.**

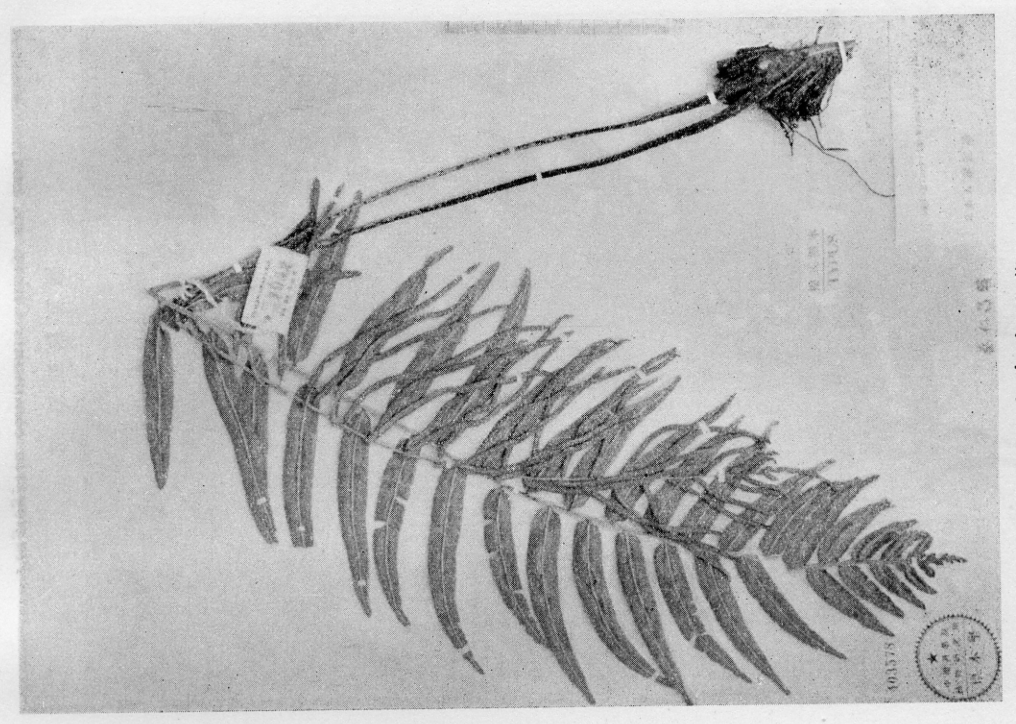


1. 两广瘤足蕨 ***Plagiogyria liankwangensis* Ching, sp. nov.**

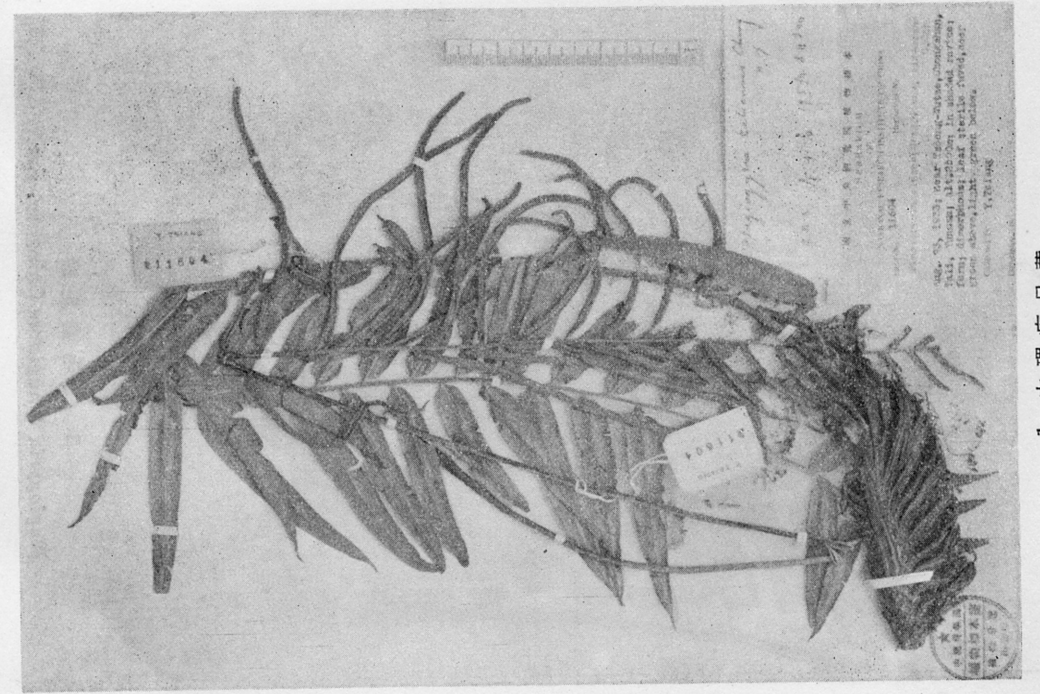
2. 短叶瘤足蕨
***Plagiogyria decrescens* Ching, sp. nov.**



1. 华东瘤足蕨
***Plagiogyria japonica* Nakai**



2. 尖齿瘤足蕨 *Plagiogyria simulans* Ching, sp. nov.



1. 大理瘤足蕨 *Plagiogyria taliensis* Ching, sp. nov.

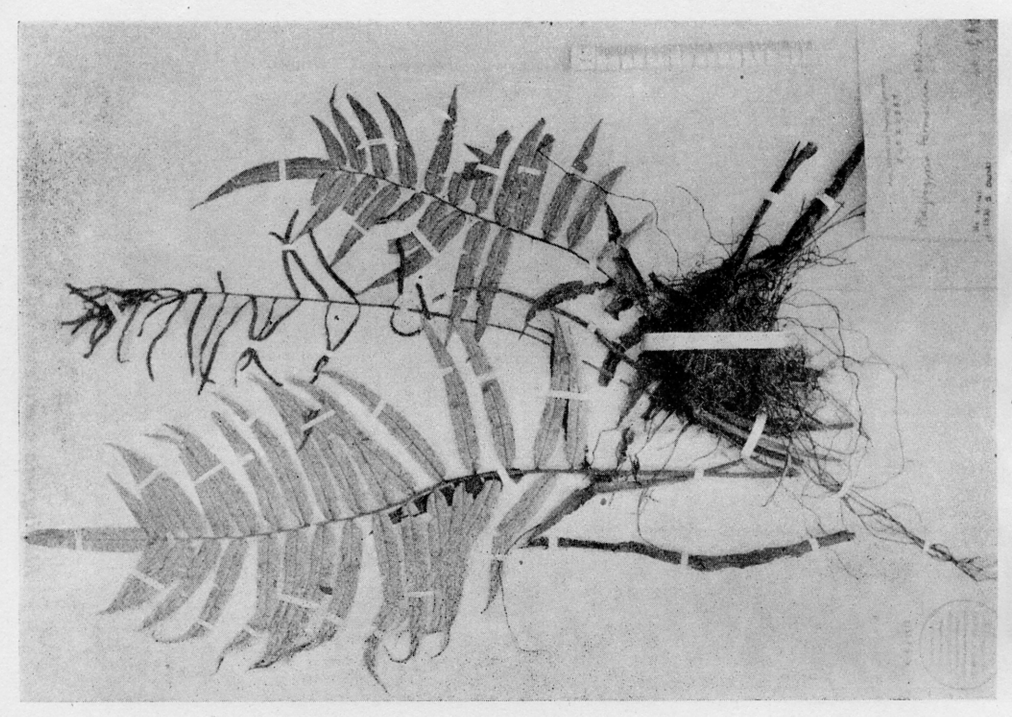
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Vol. VII Pl. XXXV

2. 滇西瘤足蕨 *Plagiogyria communis* Ching, sp. nov.

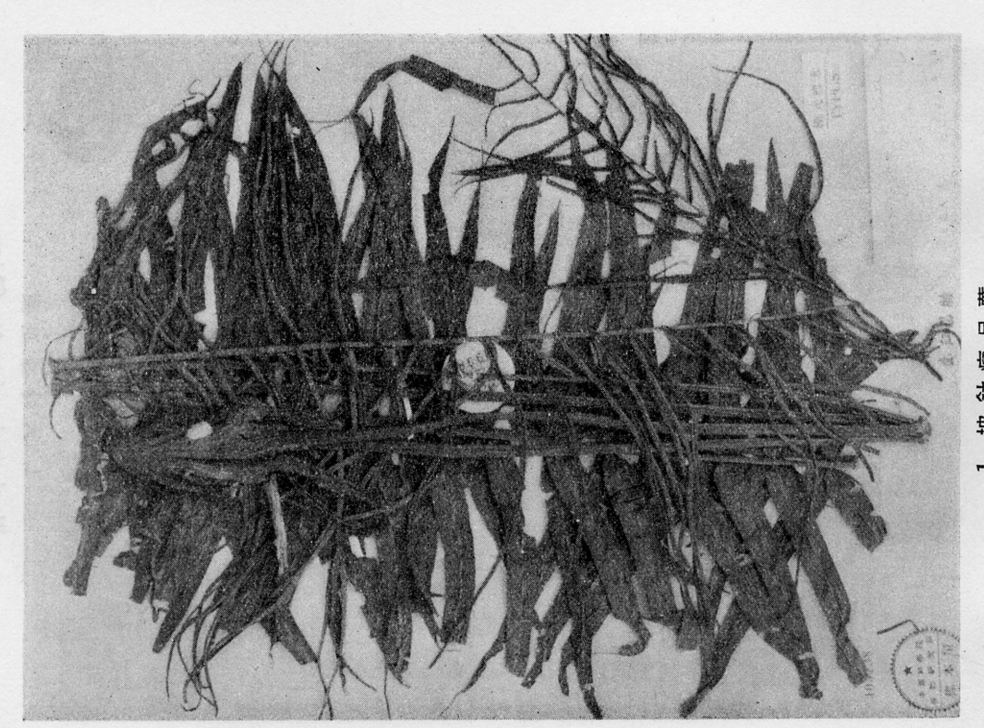
1. 絨毛瘤足蕨 *Plagiogyria lanuginosa* Ching, sp. nov.

2. 景东瘤足蕨 *Plagiogyria coerulescens* Ching, sp. nov.

1. 大叶瘤足蕨 *Plagiogyria gigantea* Ching



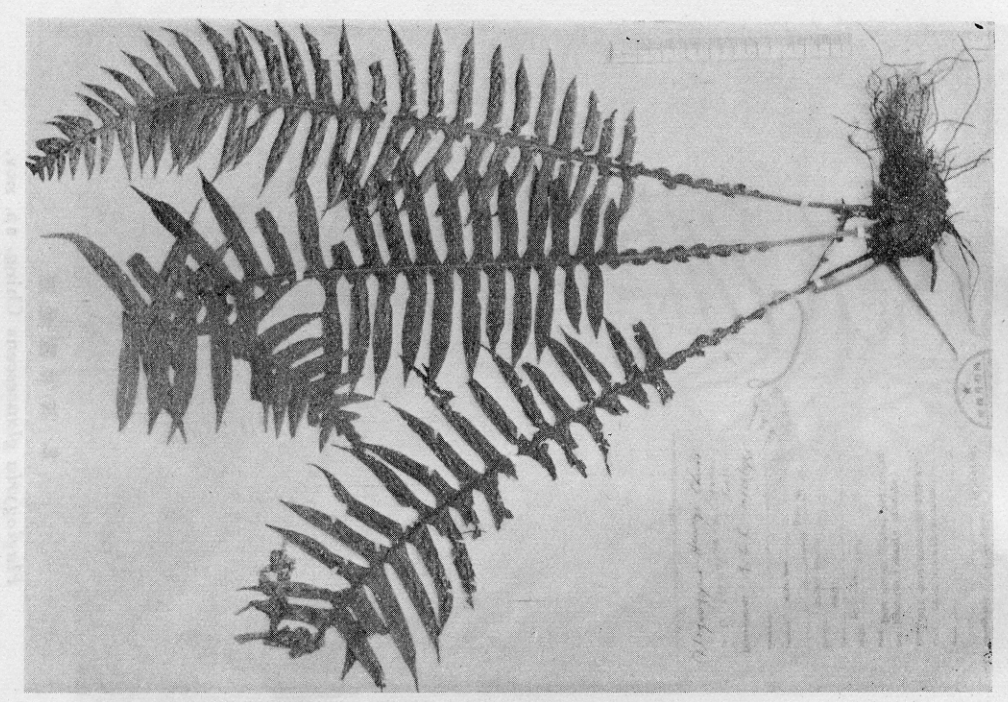
2. 台灣瘤足蕨 *Plagiogyria formosana* Nakai



1. 披針瘤足蕨 *Plagiogyria lineata* Ching, sp. nov.

2. 灰背瘤足蕨
***Plagiogyria glaucescens* Ching, sp. nov.**

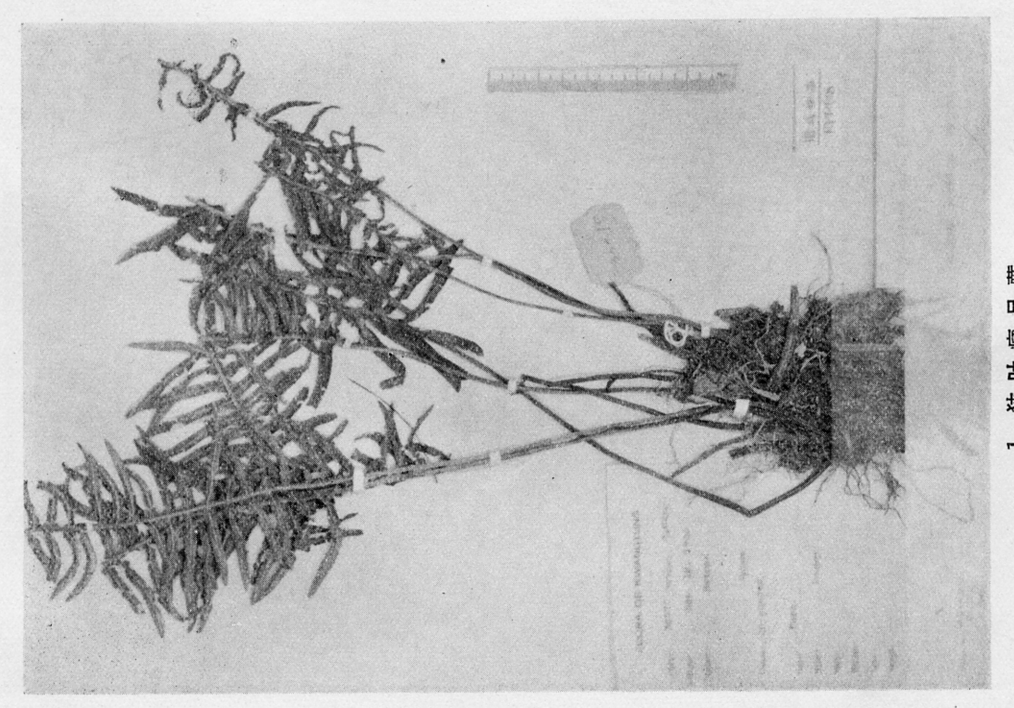
1. 粉背瘤足蕨
***Plagiogyria media* Ching, sp. nov.**



2. 耳形瘤足蕨 ***Plagiogyria stenoptera*** **(Hance) Diels**

1. 貴州瘤足蕨 ***Plagiogyria argutissima*** **Christ**

2. 倒叶瘤足蕨 *Plagiogyria Dunnii* Copel.



1. 狭叶瘤足蕨 *Plagiogyria angustipinna* Ching, sp. nov.